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The Hard Times—Their Cause and Cure

Hard Times Are Chiefly Psychological—The World Is Just as Rich Now as Before the War —We Must Have Faith, but Faith with Works

By Theodore H. Price
Editor, *Commerce and Finance*

THE hard times—their cause and cure, is a big subject and he who is doctrinaire in dealing with it is almost certain to be wrong in his conclusions.

I have just finished reading an article by Professor Whitney in the *American Machinist* of June 16. It is headed "Obstacles to Business Revival" and gives a great many reasons for the present business depression. The disparity between wholesale and retail prices, the fear of a further decline in values, the large amount of comparatively worthless paper money in circulation, the uncertainties of the tariff and taxation, the great public debts, the scarcity of capital and the inefficiency of labor are among the obstacles enumerated and described.

That all of the conditions named are present is to be admitted, but it is, I think, at least questionable whether they are the cause or effect of the hard times. *Post hoc propter hoc** states a rule of deductive reasoning that must be applied with great circumspection and often leads to erroneous conclusions. Personally I am inclined to think that Professor Whitney has reversed the logical sequence and that his obstacles are the product or effect of the hard times rather than their cause.

If this be true then the way to remove the obstacles is to end the hard times. How are they to be ended? An intelligent answer to this question involves an understanding of what we really mean by "hard times." It is doubtful whether any two persons will agree upon a definition of the phrase but nearly everyone will admit that it describes a period when men are depressed, feel poor and fear to take risks or make new commitments. It connotes a psychological rather than a physical condition, except in so far as psychic disorders are nearly always related to physical disease or weakness.

It is in this relation of the psychological to the physical that both a definition and a reason for the hard times are to be found. During the seven years that have elapsed since August, 1914, we have been under a great strain. We made a prodigious effort to help in winning the war after we entered it in 1917. The excitation of the struggle continued for nearly two years after the Armistice and because we are now physically tired and exhausted we are depressed.

In our depression we are irritable, nervous and disposed to exaggerate troubles or imagine difficulties that are non-existent as we excuse our lack of courage or confidence by pointing out what seem to be insurmountable obstacles to success and prosperity.

*Meaning literally "After this, on account of this," a Latin phrase which assumes that sequence necessarily implies causation.

Those who remember Bunyan's wonderful story will recall that when "Pilgrim" commenced to climb the "Hill of Difficulty" he had two friends with him, "Timorous" and "Mistrust," who turned back when they saw and heard some roaring lions in the way. But Pilgrim kept on and as he came closer to the lions he saw that they were chained and unable to harm him. The lesson is one that business America should take to heart just now for most of the lions by which so many of us are terrified are chained.

It is the fashion to refer to the figures of the world's indebtedness, the alleged prostration of Europe and the losses of the war with gesticulations of despair as we ask hopelessly—when shall we ever get back to normal?

The Public Debt—What It Is

Now, as a matter of fact the public debt so-called consists simply of the obligations that attest the loan of wealth previously created. In so far as the world collectively is concerned it is much as if a man took money out of one pocket and put it in another. True, much of this money has been spent for ammunition that has been used, ships that have been sunk and other things that have been destroyed, but upon the whole it is demonstrably doubtful whether the losses of war much exceed the waste of peace except as the former may include the economic value of the men killed or crippled.

In times of peace vast sums are spent for luxuries and pleasures of which we are deprived or deny ourselves when we are at war and as there is no imperishable wealth except perhaps gold and silver it is very questionable whether, as measured in money, the property waste of war much exceeds the wear and tear of peace. Take the United States for instance—everyone admits that we are richer than we were in 1914, for although we spent about forty billions in the struggle we have been able to pay all our debts abroad and have changed from a debtor into a creditor nation to which Europe owes tremendous sums.

It is true that our Government has borrowed some twenty-five billions from its citizens, but this does not mean that our national wealth is diminished for the things of which wealth consists, land, houses, railroads, mines, etc., are still here.

Conditions in Europe

England must be richer than she was before the war for she has added nearly three million square smiles to her Colonial Empire and her wealth producing equipment is uninjured. The sum total of the French national wealth must also be greater than before the war, for the value of Alsace and Lorraine must exceed

that of the property destroyed in the territory where most of the fighting took place. The French debt is heavy but it is due chiefly to the French people and in a national balance sheet which included the assets and liabilities of each citizen as well as those of the government, the obligations held would offset the debt owed. Belgium, supposed to have suffered more than any other country, has recovered with such marvelous speed that we are compelled to believe that her losses were greatly exaggerated.

Germany is intact except for the territory and the shipping she has lost. Her factories, her lands and her buildings are almost as they were before the war and her remarkable facility in industrial production is unimpaired. The same statement applies to Italy and the various self-determined political entities into which the Austrian Empire has been divided. Switzerland is admittedly richer than she was before the war. So are Holland, Scandinavia, Denmark and Spain, the last-named country having profited enormously by her war trade with both Germany and the Allies.

Russia's war losses could not have been great for she did not fight very long, but her limited industrial equipment must have suffered through disuse, though it is questionable whether her national wealth, which consists chiefly of land, has been much reduced by her adventures in Socialism. Japan is far better off than before the war and as to Canada, South America, Africa, Asia and Australasia it may be said that in an economic sense they were unconscious of the struggle except as it stimulated their productive energies.

If we had an inventory of all the property of the world as of June 1, 1914, and could compare it with another made June 1, 1921, it would probably be found that the value of humanity's assets had increased sufficiently to offset the debts incurred during the last seven years and that the world is just as rich now as it was before the war.

This statement will doubtless be challenged by some who will ask how the losses caused by what is called "the waste of war" have been met. The answer is that these losses were met by intensive production and effort while the war was being fought.

Impossible to Borrow from the Future

This was made clear time and time again by various economists while the struggle was in progress. Current losses could not have been met in any other way, for though it is popular to say that we are borrowing from the future when the Government floats a loan, it is as a matter of fact as impossible to borrow from the future as from a bank that is not yet in being. In the last analysis the proceeds of the war loans made came into the possession of the borrowing governments in the shape of the labor and material necessary for the conduct of the war. These were concrete things that had to be in existence before they could be delivered, and when delivered other forms of tangible wealth were exchanged for them.

This point is stressed because so many have been taught to believe that the future has been hopelessly mortgaged to pay the war debts of the past. To mortgage the future is impossible and the war debts now outstanding represent a lien upon values already created and not upon the production of generations yet unborn.

And as to the wastes of war—are they so much greater than those of peace?

The implements of war, dreadnoughts and aëroplanes, guns and ammunition, are of course destroyed or worn out, but a great many things which represent the investment or expenditure of capital in times of peace are just as perishable.

Our clothes wear out whether we are fighting or not. Our houses go to ruin unless they are constantly painted and repaired. The machines and machinery of industry must be constantly overhauled or renewed. The paving of our streets rarely lasts more than four years and our roads have to be made over almost every spring. The cost of maintaining our railroads in good condition is enormous and even our farm lands must be constantly cultivated and fertilized if they are to remain productive. When we are at war some of this upkeep work is neglected and the resulting deterioration is an important addition to the "overhead costs" of the conflict, but an engineer who has gone carefully into the question tells me he has concluded that the average life of all the products of human labor is not more than seven years. In his computation he has included at one extreme the modern sky-scraper as likely to last fifty years and at the other bread and butter, which are almost instantly consumed, but he points out that human energy is chiefly employed in producing the food which is eaten and the garments that are worn out within a year.

In the light of this statement it will be clear that the wastes of war do not much exceed those of peace and that in trying to account for the "hard times" we must abandon the idea that they are caused by the world's poverty.

We Are Depressed Because We Lack Faith

Wealth consists of things other than money, and of these, especially wealth producing things and opportunities, we have just as many as ever.

Why then should we be depressed after the war's strain is ended and we have rested up sufficiently to recover our normal energy and cheerfulness?

The answer is, I think, that we lack the faith in the future that has been so gloriously defined as "the substance of things hoped for and the evidence of things unseen." To the economist who insists upon relating business activity or idleness to some material fact or condition this may seem an inadequate answer, but not many economists have as yet come to understand how close is the correspondence between the spiritual and the material.

Probably this is because there is a mistaken tendency to regard the words spiritual and religious as nearly synonymous, which they are not. Faith is a spiritual quality because it enables us to project a picture of the future upon the canvas of the present and then to make the picture a reality, because it gives us confidence in ourselves and in our fellow man—because in the face of present discouragement it enables us to believe,

> "That through the ages one increasing purpose runs
> And the thoughts of man are widened with the process of the Suns."

It was through faith that this Government, then an entirely new political experiment, was established. It is through faith that it has been made a success. It was through faith that we won the war—and it is through faith that we can win the peace if we will but stop looking backward upon the big profits and high wages that we were able to get while all the world

competed for the products of our labor and content ourselves with a reasonable compensation for the services that we can render.

But "faith without works is dead" and it is not enough to believe. We must be industrious and if we cannot find employment at what we think we are worth we must be willing to take less.

It is impossible to avoid some injustice in making the complicated readjustments that have now become necessary, but life is one long series of compromises. To be happy and useful we must compromise with our wives and our husbands, our children and our friends, our employers and our employees. It is natural that we should try to get all we can, but we must learn to give as well as to take, for the important thing is that the machinery of the world's industry should now be started up and it can't be done unless we all put our shoulders to the wheels and start them turning without regard to whether others will make more or less than we do when activity is resumed.

Our resources are undiminished, our opportunities are numberless and the obstacles in the way of their development are chiefly the creatures of our imagination.

The fellow who generally gets a job and oftenest comes to be a boss is the boy who says "put me to work and pay me what you think I am worth." He has faith and industry—the qualities that will triumph over all the obstacles that the economists can conjure up.

The Cost of Cost Systems

By John R. Godfrey

Just as charity covers a multitude of sins, so cost systems cover a multitude of non-productive expenses. And it's these non-productive costs that must be discovered and pruned to the quick before we get back to a really economical manufacturing basis.

In the days when the boss kept most of his costs in his head and the bank balance was his only measure of success, we seemed to be a long way from scientific or economical operation. Then cost systems became fashionable along with time clocks, typewriters and other paraphenalia. Not that we didn't need them all, the difficulty was that we either got the wrong kind or else didn't know how to use them.

The trouble with most cost systems is that they are postmortems after the patient is dead. They tell us what the machines cost, but it's after they are made and the money has gone up the flue. And they are usually so far behind that the next lot may be well under way before you know how much money you lost on the last lot.

One of my good friends had that kind of a cost system some years ago. He stopped in the cost office one morning to get some figures on a new lot of machines that were coming through the shop. The cost department couldn't tell him because it was three weeks or more behind in posting the data from the time cards and it hadn't much notion as to when it might catch up. There were so many cards in this particular system that it was some job to keep them all straight.

Burning Up a Cost System

Now this friend is a forceful individual, who wants what he wants when he wants it, and particularly when he knows that he ought to have it if it's going to be any use to him. So he called the janitor, ordered him to gather up the whole lot of cards and chuck 'em under the boiler. Said they might be some use as fuel and they weren't a darn bit of use to anybody as they were. Then he told the petrified cost keeper that until he could devise a cost system that would tell what costs were while it was still a live subject, they would worry along without any system.

In another case where they are building a standard product which has practically not changed in any important item for ten years, the "old man" threw out a cost system and six hundred cost clerks which had been acquired during his absence from the shop and they are still running without any cost system. His contention was that they had built this product so long that there ought not to be any question about costs if the department heads were on the job as they ought to be.

This is pretty drastic medicine of course, and it might not work in many places. But hasn't it, after all, a great big grain of horse sense tucked away in it, perhaps unconsciously? Haven't we become so absorbed in systems and records that we've failed to make the best use of either the men or the department heads? Haven't we gone to extremes in making records which no on ever uses and which in many cases are never available in time to be of any real use on the job that is under way?

Some of my friends have cast their lot in railroad circles and have worked their way to the top. They now regretfully spend much of their time poring over reports which come in by the carload and might easily account for much of the paper shortage we hear of occasionally. And they admit, on the Q. T, that they don't begin to read them all, because if they did, there wouldn't be time for anything else.

Now I haven't any intention of starting a crusade against all systems and records. But the man who will head a movement for the abolition of useless and unnecessary records will be a benefactor in more ways than one.

And just to show that all this may not be as crazy as it may sound to those whose idea of business is rules and systems and records so that the human equation is represented by the office boy, I may say that some of the really big men in the industry are spending a lot of time and thought on how to eliminate some of the many systems and records which our yearning for things scientific have brought upon us. One of the basic principles of such a plan, is that the average man can develop a little common sense if he has the chance to exercise it.

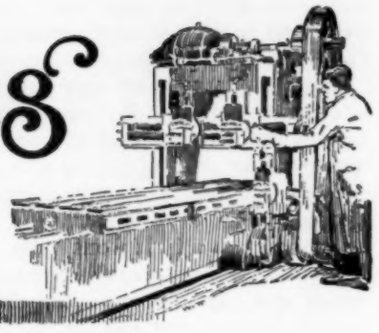
Now that times are less strenuous than they were, it will pay the big boss of almost any establishment to miss an afternoon or two of golf and study some of the non-productive costs, or perhaps "indirect costs" may sound better even if it isn't quite so accurate. After he recovers from the shock of what those systems and records of his are costing, he might look a little further and see just how much or how little use is made of the data after it is collected.

He may find that it's all useful and well worth the money—and then again he may decide that it is his patriotic duty to help conserve the national paper supply. In any case it's worth trying. And he may be surprised to find that his direct or productive costs are less than he supposed.

"Don't let your cost systems cost too much" might not be a bad slogan just now.

Metal Cutting Tools.

By A. L. DeLeeuw



XII. Form Tools—Plate Tools, Bar Tools and Circular Form Tools—Advantages and Disadvantages of Each—Shaving Tools and Their Action

FORM tools are tools that will produce the desired shape of a piece of work without the assistance of the feed motions of the machine. If we wish to turn up a cylindrical shaft we would normally use a single point tool and depend on the feed motion of the lathe to move the tool in such a way that the result will be the desired cylinder. If we wish to produce a taper shaft we would use the same tool, but make some adjustment in the machine so that the feed motion will produce a cone. We could produce either of these shapes by using a broad tool and forcing it against the work, either by hand or by power, without making use of the feed movement. This broad tool would then be a form tool. As a rule, form tools are not of such simple shape.

With the exception of some special cases, it would be very poor policy to try to produce a cylindrical shaft by the use of a form tool, especially if the shaft is rather long. Yet it may very well be that we would apply such a tool in some hand-screw machine or a Gridley Automatic or, for that matter, in any other automatic machine. We might wish to turn up a short shaft with shoulders at both ends so that it would not be possible to turn up more than half the shaft by means of box tools. In that case, it might be good practice to turn up the second half of the shaft simultaneously by means of a form tool. However, the great advantage of form tools becomes evident when the piece to be turned up or planed or milled is of complicated section.

We have already made the acquaintance of a number of form tools such as the button tool for a planer, and

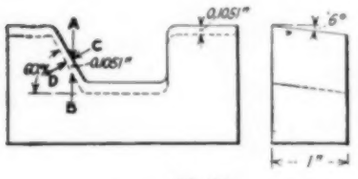


FIG. 189

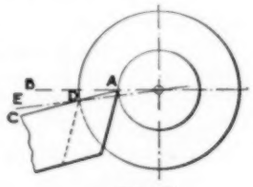


FIG. 190

FIG. 189. PLATE TYPE FORM TOOL. FIG. 190. SIDE VIEW OF SAME TOOL MADE WITH RAKE

the formed cutters, gear cutters, etc., among the milling tools. We will now consider form tools in their narrower sense; that is, such tools as are used for the production of irregular work on planer, lathe and especially the screw machine.

The most obvious advantage of a form tool is that the entire section of the work is produced at once without change of tools, without complicated feed motions, and without great skill on the part of the operator. A second advantage is that it is necessary to measure one diameter of the finished work only in order to be sure that the entire section is correct, provided, of course, that the form tool itself is correct and that it has been adjusted in the proper manner. In other words, the form tool lends itself particularly well to repetition work.

The most obvious disadvantages of form tools are that it is difficult to produce them—in other words, that they are not economical except for repetition work—and that it is not possible to obtain the same speeds and feeds which might be used with single point tools.

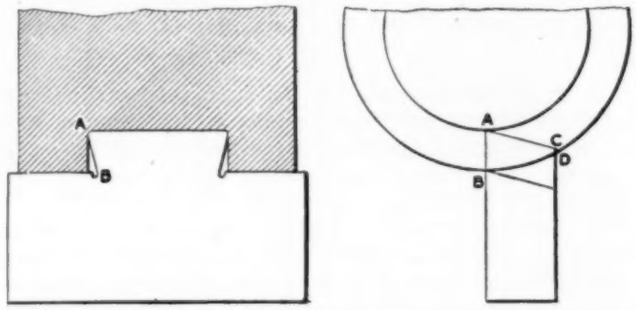


FIG. 191. UNSUCCESSFUL ATTEMPT TO ELIMINATE DRAG

This is due to the inherent difficulties of a form tool in regard to presenting the proper angles to the work.

Form tools are made in many ways. Fig. 189 shows a tool of the plate type. Such a tool is merely a plate of tool steel with a contour corresponding to the contour of the work to be made. The cutting side is made to a bevel. Fig. 189 represents this bevel as being 6 deg. The tool represented here has three lines parallel to the axis of the piece to be turned up, one line with an angle of 60 deg., and one line at right angles to the axis. The thickness of the plate is supposed to be 1 in. The top of the plate is shown in full lines, while the bottom of the bevel portion is shown in dotted lines. It may be said then that the full and dotted lines show the clearance of the tool. The distance between the two lines on the horizontal branches is $1 \times \tan 6 \text{ deg.} = 0.1051$. On the bevel portion the distance between A and B is, of course, also 0.1051, but this distance is not the clearance. We will have to take the distance CD at right angles to the bevel portion of the tool to find the true clearance. This distance equals $AB \times \sin 30 \text{ deg.} = 0.0526$. In general, if we call the clearance angle A, and the angle of an element of the form tool with the axis of the work B, the amount of clearance

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which we will have at that element may be expressed thus: tangent of clearance angle equals tangent *A* times cosine *B*. When *B* approaches 90 deg. its cosine approaches the value zero, and therefore the clearance angle approaches zero. We see then that on the vertical branch of the form tool there is no clearance and as a consequence this side will drag along the work, will not make a satisfactory finish, and will be the first part of the tool to break down.

The tool as represented here has no rake. Fig. 190 shows what the result would be if we attempted to construct the tool with rake. The same tool is represented here constructed with rake and turning up a piece 2 in. on the larger, and 1 in. on the smaller diameter. The point *A* is set to the center of the work, and the angle *BAC* is the rake. We will suppose this angle to be 15 deg. We will further suppose that the point *D* is at the deepest part of the tool. The angle of rake at this point is the angle *DEC*. It will readily be seen that

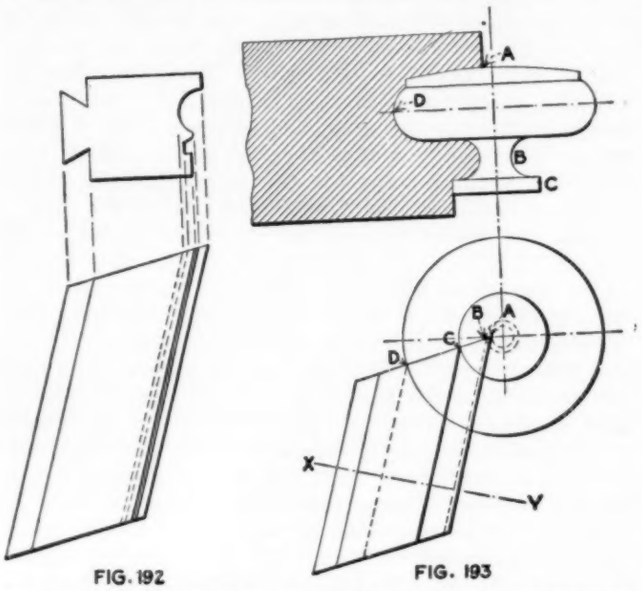


FIG. 192 FIG. 193

FIG. 192. TYPICAL BAR TOOL. FIG. 193. AN EXTREME CASE SHOWING A COMMON DIFFICULTY WITH BAR TOOLS

this angle is not the same as *BAC*. The following calculation shows that this angle is 7 deg. 20 min.:

In triangle *OAD*, $OA = \frac{1}{2}$ in., $OD = 1$ in. and angle $OAD = 180$ deg. $-$ 15 deg. $= 165$ deg. Also.

$$\frac{DO}{AO} = \frac{\sin OAD}{\sin ODA}$$

$$\sin ODA = \frac{AO}{DO} \sin OAD = \frac{\sin OAD}{2}$$

$$= \frac{0.2588}{2} = 0.1294$$

$\therefore$ angle $ODA = 7° 20'$

Not only does the rake change for the different points of depth of cut, but it also changes with the angle which the element of the tool makes with the axis of the work. We would find, for instance, that any angle of the bevel part of the tool (see Fig. 189) has less rake than that of a horizontal element cutting to the same depth, and we will further see that the vertical branch of the tool has no rake at all. Not only, then, has the vertical branch a tendency to drag over the work, but it has a much more severe duty than any other part. This unfavorable condition of the vertical branch is brought out very strongly if a horizontal and vertical branch join without chamfer or curve. However, we must not forget that as a rule, the amount of feed per revolution

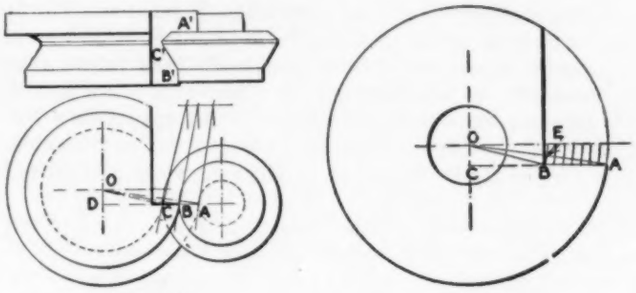


FIG. 194 FIG. 195

FIG. 194. CIRCULAR FORM TOOL. FIG. 195. DEVELOPING CIRCULAR FORM TOOL CONTOUR

of the work is very small where we use a form tool and it is only this amount of the feed for which the vertical branch comes into action. So that if there is a chamfer the fact that the vertical branch has no rake is of much less importance than that it has no clearance. In many cases there are branches of the form tool which are not exactly vertical but very nearly so. In that case, this branch must remove metal over its entire length, and that without having any rake, practically speaking.

In the great majority of cases a form tool is used without any rake whatsoever.

Fig. 191 shows an attempt at avoiding the drag of the vertical branch of the form tool over the work. The branch *AB*, if made vertical, would drag along the finished part of the work which is shown by shaded lines. Realizing that the feed per revolution of the work at the point *A* is very small, the line *AB* has been made to retreat from the finished work and a very small land is provided at the point *A* for the purpose of avoiding grooves in the finish. Looking merely on top of the form tool, one might think that this wrinkle overcomes the difficulty. As a matter of fact it does not. On the contrary it causes the tool to break down sooner on account of drag. The side view shows a cross-section of the work with the tool in position, and indicates that the part of the tool from *A* to *C* will rub against the finished part of the work. If the line *AB* had been made vertical instead of sloping, the entire surface *ACDB* would be bearing against the work and would be subject to wear. As the tool is shown in the illustration, only the sharp edge *AC* is bearing against the work and will of course wear out much sooner than if the entire surface *ACDB* were coming into play. We will come back to this matter in the discussion of circular form tools.

There are many possible constructions of form tools, but they may be classified as follows: 1, plate tools; 2, bar tools; 3, circular form tools. Each of these three constructions has its own applications.

The plate tool is easily constructed and is easily resharpened on a surface grinding machine but its life is not very long, so that the percentage of tool steel wasted would be an important item in regular production. However, where parts must be made in relatively small quantities, this tool is preferable on account of its cheapness of construction. Tools of this kind are almost invariably made without rake and have a greater tendency to spring the work and chatter than tools with rake.

Bar tools are of the general construction shown in

Fig. 192. They can be made with rake, are easily ground and will stand many resharpenings; but the way in which they must be held in the machine makes them less applicable for smaller machines.

When making a bar tool with rake, careful consideration should be given to the special features of the case. It may be an excellent thing to provide rake in one case and entirely inadvisable in some other case. In Fig. 193 an extreme case is represented in order to bring out that rake on a bar tool may lead to serious trouble. The circles *A*, *B*, *C* and *D* in the end view correspond

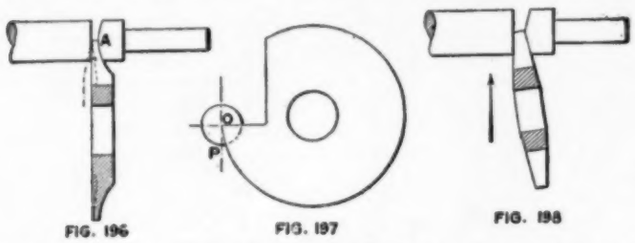


FIG. 196 FIG. 197 FIG. 198

FIG. 196. CUTOFF TOOL COMPLETING CUT. FIG. 197. END VIEW OF SAME TOOL. FIG. 198. CUTOFF TOOL WITH CLEARANCE ALL OVER

with the points *A*, *B*, *C* and *D* of the plan view. The tool is on the center at the point *A*, and is supposed to have the proper amount of clearance and the proper amount of rake. It will be seen that under the conditions as shown the clearance increases and the rake diminishes going from *A* to *B*. In fact, the illustration shows that there is negative rake at *D*, so that cutting would not be possible at that point. It also shows that the amount of clearance is entirely too much at the same point. However, this should not be construed as condemning the use of rake in this type of form tool, but merely as a warning to consider carefully and preferably lay out the exact conditions under which the form tool may have to work before deciding the amount of clearance and rake to give at any one point, and even before deciding whether *any* rake should be given. If rake is given at all, great care must be taken in laying out the normal cross section of the tool. When planing or shaping or milling the tool the movement of the generating tool (planer or shaper tool or milling cutter) is at right angles to the line *XY*, or in other words, at right angles to the cross-section of the tool. And this cross-section must be made so that the points *A*, *B*, *C* and *D* become located in their proper position. If the tool is made without rake, but is set so that it makes an angle with the vertical plane equal to the clearance angle, then the normal cross-section of the tool would be merely a projection of the desired section at the angle of the clearance; but if rake is given, then each point must be studied out individually.

Circular form tools are used more and are known better than any other kind. They are not quite so easy to make, but have a long life, and waste very little tool steel. They are easy to regrind and to reset. On the other hand, they are not easily controlled as to clearance and rake.

Fig. 194 shows a circular form tool in section and in side view. As is well known, a notch or gap is made in the tool so as to obtain a cutting edge. In order to have clearance the gap should be made below center; in other words, the line *AC* should not be a radial line, but should be a line tangent to some circle struck from the center of the tool. If the radius of this circle were ¼ in., then it is very important that for every regrinding this distance of ¼ in. be maintained. It is, therefore, advisable to mark on the form tool the size of the circle to which the line *AC* should be a tangent. As a rule, this is not done.

The clearance at the point *A* depends on two things: the radius of the cutter at this point, and the diameter of the circle to which *AC* is tangent. If the radius of the cutter is *R*, and the radius of the circle to which the line *AC* is a tangent is *a*, then the sine of the angle of clearance equals $\frac{a}{R}$. Now it will be seen that the various points of the form to be produced will have different distances to the center of the tool, and that, therefore, the amount of clearance varies for the different parts and is greatest for those parts which are closest to the center.

We did not have this condition with the plate or bar form tool. In them the angle of clearance varied with the angle between an element of the tool and the axis of the work. The clearance was a maximum only when this element of the cutting edge was parallel with the axis of the work, and a minimum when the element was at right angles to this axis. This same condition prevails of course with the circular form tool but in addition there is to be considered the variation which comes from the fact that the tool is circular in form and that various points of the outline are located at different distances from the center line of the tool.

Fig. 194 shows the various clearance angles at the points *A'*, *B'* and *C'*; provided, of course, that we consider only those elements which are parallel with the axis of the work. It would be perfectly feasible to make such a tool with rake. As shown, the line *AC* is in a horizontal plane. If this line had been drawn in a plane of which *A* is the higher and *C* the lower point, the tool would have been provided with rake. The amount of rake would be a variable quantity, just as it was with the bar or plate form tool; and furthermore, if we had placed the point *C* lower for the purpose of getting rake, the amount of clearance at that point would be still further increased.

Where the form tool is very large and the length of the line *AC* is very small, the variations in clearance angle would be rather small and would not need to be considered, but this is not the way circular form tools are made. One reason why they are used at all is to reduce the amount of waste steel, and if the diameter were made large in proportion to the length of *AC*, a very large portion of the tool would have to be thrown away. Furthermore, if the line *OA*, the diameter of the tool, were made large it would be necessary to make the distance *a* quite considerable in order to have sufficient clearance at the point *A*. If such procedure were followed it would mean that we would need a high toolpost and this is very undesirable. If such a high toolpost were used, not only would we have all the difficulties of too much leverage, but it would prevent us from using a small form tool, for with a large distance *a* and a small

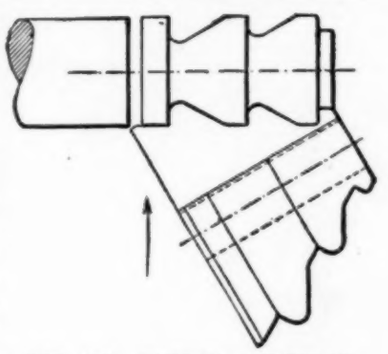


FIG. 199. SPECIAL CIRCULAR FORM TOOL

radius *OA* the clearance at the point *A* would be too much and the clearance at the point *C* would be still worse.

Generally speaking it is desirable to keep the center of the tool as low as possible. If we do this and keep the form tool reasonably small, the only trouble we are apt to meet is that we may have too much clearance at the point *C* when we have considerable depth of cut.

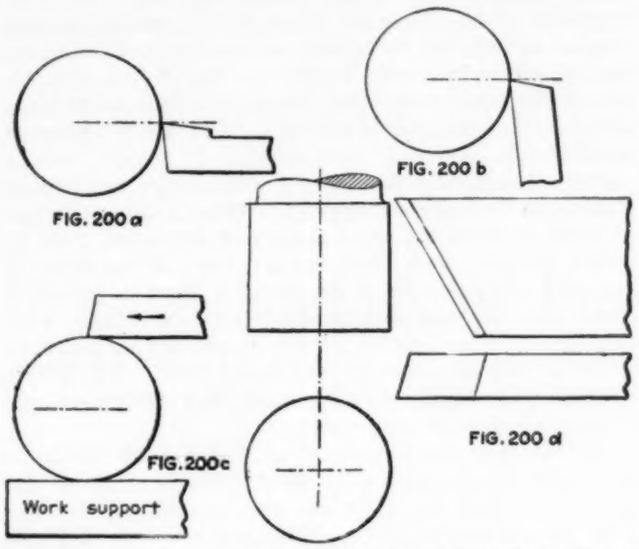


FIG. 200. ACTION OF SHAVING TOOLS DIAGRAMMATICALLY ILLUSTRATED

Too much clearance means a weak tool at the cutting edge and resulting chatter. For this reason the circular form tool is as a rule not desirable for large and heavy work, especially where deep impressions must be made. These difficulties are of not much importance where the work is small and where the depth of impression cannot be very great.

To illustrate this further by example, let us suppose a form tool is to be used on a ⅝-in. screw machine, where the depth of impression cannot be more than $\frac{5}{16}$ in., in case we use the form tool for cutting off. Such a form tool would not be less than 2¼ in. If we make the clearance at the point *A* seven degrees, the center of the tool would have to be 0.137 in. above the center of the work. The point *C* which is located $\frac{5}{16}$ in. further inward, would be $\frac{11}{32}$ in. from the vertical centerline of the tool. Its clearance angle is the angle *OCD*. Tan *OCD* = *OD* ÷ *CD* = 0.1686, which shows that angle *OCD* equals 9 deg. 35 min. Though there is a marked variation in the clearance angles, the difference is not enough to cause any trouble.

Now let us suppose that we also use a circular form tool in a 6-in. automatic. Of course we would not make the form tool in proportion to the size of the work. If we did, we would have to use a form tool of more than 21 in. in diameter. What we would do is to use a form tool in which we can make a 3-in. impression and yet have some metal left around the stud holding the tool. Such a tool would be, perhaps, 8 in. or 9 in. in diameter. Let us assume it to be 9 in.; then the distance, *a*, figuring on a clearance angle of seven degrees, would be 0.5485 in. The distance *CD* would be 1½ in., and the tangent of angle *OCD* would be 0.3657; so that angle *OCD* would be 20 deg. 5 min., which is entirely too much.

Referring again to Fig. 194, it is easily seen that the contour of the tool around the cutting edge is not the same as the radial section; so that if we wish to make a circular form tool we must take care that its shape shall be correct on that plane which we are going to use for the cutting edge. We found the same thing to be the case with plate and bar form tools, and we found also that all we had to do there was to project the correct form into another plane, making an angle equal to the clearance angle with the top of the plate or bar. This is not a difficult matter to do and was discussed at some length in the chapter on formed cutters.

Form tools are often used in screw machines for the purpose of making pieces which receive no further operation, and it may be necessary to have the different diameters of the piece correct to a high degree of accuracy. If this is the case, it becomes important to have the form tool also accurate to a high degree. In the plate or bar form tool, all points of the outline could be projected on some other plane, but in the circuular form tool this cannot be done if theoretical accuracy is required, because the clearance at each point of the cutting edge depends on the distance of that point from the center of the tool.

In Fig. 195 a form tool is shown in which *AB* is the cutting edge. In order to find the correct shape of the radial section of this tool, the various points of *AB* should be circled over with *O* as center. One of these points, *E*, is shown. It is the proper projection of the point *B*. If we should draw a line from *B* perpendicular to *AO*, we would not have obtained the point *E*, and the distance from this point to the point *E* would be the error. As a rule this error is very small.

To illustrate this we will assume that the form tool is 3 in. in diameter, so that the line *OA* is 1½ in. We will further assume that the depth of impression, that is, the line *AB*, is ¼ in.; and that we desire a clearance angle of eight degrees at the point *A*. With these assumptions we find that the line *OC*, that is, the distance to which the center of the tool must be set above the

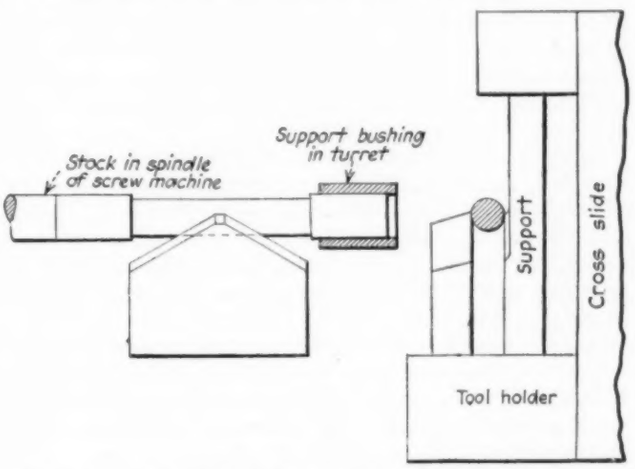


FIG. 201. AN EXAMPLE OF SHAVING TOOL WORK

center of the work is 1½ in. × sine 8 deg. = 0.208755 in.; and from this we find that *AC* = 1.485 in. As *AB* equaled ¼ in., we find that *BC* equals 1.235 in. We can now calculate the line *OB* in the triangle *OBC* and find that its length is 1.2525 in. If we circle this line *OB* over, we obtain the point *E* on the radius *OA*, and as *OA* equals 1½ in., and *OE* equals 1.2525 in., we find that *AE* equals 0.2475 in. This is the depth of the

impression of the templet or generating tool required for our form tool.

If we had drawn a line from *B* perpendicular to *AO*, we would have found a point E_1, and the length *AE*, would have been $AB \times \cos 8 \text{ deg.} = 0.2478$ in. This is 0.0003 in. more than the theoretically correct distance. For any other point of the line *AB*, this error is even smaller.

There are very few cases where such a small error would not be permissible, and where this error is allowable, we can use the method described in the chapter on formed cutters; that is, take a wedge-shaped piece of metal with an angle or wedge equal to the clearance angle, draw the correct outline on one side and file out the shape at right angles to the other surface. Then this other surface will give the correct outline for the templet or generating tool.

If the depth of impression is greater, or if the clearance angle is greater, or the diameter of the tool smaller, the amount of error increases; so that with a small form tool with relatively deep impression and which stands relatively high above the center of the work, the error may become of sufficient magnitude to cause trouble, especially when accurate work is desired. It is, therefore, well to look carefully into the merits of the case before deciding whether this simple method of projection is applicable.

It often happens that after a piece has been cut off in the screw machine, the end of the bar requires no fuurther finish after it has been fed out for a new piece, at least as far as accuracy is concerned. It may be desirable, however, to have this end look presentable. If we use a circular cut-off tool with straight sides, we are almost sure to have a rough finish at the end of the bar. Fig. 196 shows a cut-off tool which has just finished its operation. The right side of the cut-off tool is made curved and has therefore some clearance at all points except the extreme forward point *A*. The left side of the tool being a straight line has no clearance anywhere and the end of the bar is almost sure to be ragged and to present a torn-up surface. Sometimes an effort is made to avoid this condition by cupping this side out as shown in the dotted line under the impression that the tool will then have clearance. This, however, is a mistaken idea.

In Fig. 197 the same bar and the same tool are shown in end view. This figure shows clearly that the edge of the cutoff tool rubs against the bar from *O* to *P*. The only cutting point on this line is the point *O*. As a result, the point *O* loses its cutting qualities almost at once and causes the torn-up surface. In order to overcome this difficulty, one should have made the tool as shown in compound lines in Fig. 196. A very small amount of taper will be enough to produce a better finish, 0.001 in. or 0.002 in. might be sufficient for small work. As a rule the taper end of the bar is not objectionable.

In many cases the end of the work where it is cut off receives some further operation before the piece is entirely finished. In that case, it is not necessary to have the point *A* without clearance, and if this is so, we can arrange our cutoff tool so as to produce a straight end of the bar and yet have clearance all over. Fig. 198 shows this condition. In Fig. 196 the side of the cutoff tool nearest to the bar was a plane surface; in Fig. 198 this side is made part of a cone. It will readily be seen how this causes clearance at all points of the cutoff tool. Such a tool must be set in an angular position in relation to the toolpost, and for that reason may require a special toolpost.

Many times the contour of the piece to be produced has a vertical branch which must be carefully finished because it does not receive any further operation. Where there is only one vertical branch, or where all the vertical branches point in the same direction, the same little artifice as shown in Fig. 198 can be employed. Fig. 199 illustrates this. The only objectionable feature to this wrinkle is that the form tool becomes somewhat larger than it otherwise would have been; but it has so much longer life and makes the work so much more presentable, that one should not hesitate to use it wherever possible.

For rapid production on screw machines, high-speed steel form tools should be used. Where a large number of form tools of the same shape are employed, that is, where several screw machines are busy all the time on one and the same piece of work, it pays to generate form tools by the process of circular milling. This requires a formed cutter of the proper shape, and such a cutter can be made of high-speed steel. But where a single form tool must be made, this system of circular milling no longer applies.

In that case, a flat generating tool is made and it is generally found that it is very difficult to keep this generating tool to size when cutting high-speed steel. This has a tendency to produce a form tool of which the shape is not entirely correct.

A further error is introduced by hardening. This error caused by hardening appears twice when we produce the form tool by the circular milling method. In addition, the high temperature to which the high-speed steel must be subjected for hardening has a tendency to roughen the surface, so that not only does a high-speed steel form tool have a tendency to be off shape, but in addition has a tendency to present a rough cutting edge and to produce a rough piece of work. The roughness of this hardened high-speed steel, seen under the magnifying glass, appears often as little globules and little hills. These hills may cause a lack of clearance at some points, and if this is the case, the tool will have a short life.

For all of the above reasons, it is advisable to grind the form tool to its correct contour after hardening. At the present time, there is no machine in existence specially adapted to this kind of work, but there are now several machines which might be rigged up to do this kind of work very satisfactorily. Any contour-grinding machine, such as the Pratt and Whitney or the Barnes, can be arranged for this purpose. The form tool should be mounted on an arbor just as if it were a formed cutter. The arbor should be held in a spindle which can rotate in a fixture, and should be driven by a belt from the countershaft. A templet should be made just as for the contour grinding of a formed cutter, and the form tool should be moved past the grinding wheel while it is rotating.

A peculiar kind of form tool is the so-called shaving tool. Whereas the feed of the ordinary form tool is from the outside of the piece toward its center—that is, radial—the feed of a shaving tool is tangential.

Fig. 200 shows a straight piece of work in cross-section, and a broad nose tool finishing the piece. There is nothing out of the ordinary in this arrangement. If we should modify it as shown in Fig. 200*b*, we will still have the same conditions, but, used in this form, the tool might be called a shaving tool. As a rule the

work is supported when a shaving tool is used, as shown in Fig. 200*c*. In this form, shaving tools are used to obtain the size of the piece to a high degree of accuracy and the amount of metal removed is always very small. If the piece to be finished is short, a broad-nose tool will do the work very nicely, but if it is long, the pressure in the direction of the arrow would be quite considerable, would cause chatter and would deflect the piece sufficiently not only to prevent getting the correct diameter, but, as the deflection would not be the same at all points along the length of the piece, there would also be a variation of diameter. Fig. 200*d* shows the same piece and the shaving tool, which is shown in dotted lines. It will be seen that the cutting edge is set to an angle with the axis of the piece, so that only a short piece of the tool is at work at any time.

Such a shaving tool has been used in a rather peculiar way for the work shown in Fig. 201. The piece of work was a rather long and very frail shaft of which the central portion that was by far the greater part of the length, had to be recessed. The shaving tool used in this case had a double bevel, so that the recess was started at its center and continued toward the ends. The piece had to be reduced in diameter about $\frac{1}{64}$ in. The bottom was supported on a plate of practically the same shape as the tool. The total width of the tool was about 6 in. In this manner it was possible to take what really amounts to a forming cut of great length, on a piece of very small diameter.

In the chapter on shear tools, a further discussion will be given of the action of shaving tools and their limitations.

A History of Post-War Crises—III

Conditions During and Following the World War—Rise and Fall of Prices from 1914 to 1920—What Is to Be Expected After a Prolonged Conflict

By H. H. MANCHESTER

THE boom which took place after the World War was by no means confined to the United States. This is very evident from a brief review of the course of prices in the various countries. In some countries the most available data deal principally with foodstuffs and other items directly involved in the cost of living, as the H. C. of L. was the most discussed, and "cussed," feature of the times.

With prices in the period just before the war taken as 100, food prices in Great Britain in January 1919, practically at the close of the war, had reached 230, and general prices 217. In July 1919, food prices dropped to 209, but general prices increased to 239. Then the boom began which carried food prices to 236 in January 1920, and general prices to 288. The high point for general prices was reached in March at 310. They then gradually dropped and in July were 293. At that time food prices averaged about 258. The spring or middle of 1920 seems to have been the peak of the boom throughout the world.

In France food prices had reached 248 in January 1919 and general prices 347. The success of the war produced such a feeling of elation there that there was no decided drop, but a comparatively steady rise in prices. In July 1919, food prices were 261, and general prices 349. In January 1920, food prices had reached 290, and general prices 488. Then a decided boom began which lifted general prices to 587 in April, after which they began to drop. Food prices in July were 373, and general prices probably about 450.

In Belgium food prices were quoted at 639 in January, 1919, which in itself gives an idea of conditions in the territory which had been occupied by the Germans. In the next six months they dropped to 354. Then the boom began which raised them to 410 in January 1920, and to 479 in July of the same year.

It Italy food prices were 259 in January 1919, and general prices 327. A drop in food prices to 206 occurred in the next six months, while general prices rose to 359. From this point both began to rise rapidly; general prices reached 504, and food prices 275 in January. The peak in general prices was reached in April at 679, at which time a rapid drop began. In July food prices were 318, and general prices probably about 570.

It must be remembered that all of these countries are on a paper basis, and that the prices are quoted in such currency. The situation is much the same as in the United States at the close of the Civil War when prices were stated in greenbacks.

In Canada general prices were 211 in January 1919, and 217 in July. Food prices were 186 in both January and July of 1919. They rose to 206 in January 1920, and to 227 in July of that year. In the meantime general prices had jumped to 250 in January 1920. They reached their peak at 263 in May, and sagged to 256 in July.

By far the most important of all the foreign countries in the history of prices after war was Japan. Although far distant from the seat of the conflict, general prices there rose to 214 in January 1919, and to 242 in July of that year. By January 1920, they arrived at 301. The peak was reached in March 1920, at 321.

Raw silk in the meantime, had jumped from a pre-war price of perhaps 900 yen, or $450 per bale, to 1,670 yen in June, 1919, 2,200 yen in October, 1919, and to 4,500 yen in January 1920. Thus the price, it will be noted, was five times that before the war.

In the meantime a remarkably heavy flotation of companies had been going on. In 1919 these had ten times the capitalization of four years before. The government was optimistic and did all it could to assist the companies, which it in fact controlled, to hold up prices, but the price of silk had outrun the market abroad and on April 7 began a panic which closed a number of the exchanges. The price of silk plunged suddenly to almost a pre-war level, and general prices slumped also. In July they reached 239, eighty points below their March peak. Many manufacturing plants were closed and wages took a big drop.

This was the first crisis and, in fact, the first decided break in prices after the war. A careful consideration will probably show that it was this crash which precipitated the fall in prices in other countries. This slump showed itself first in England, which in many ways was most closely associated with Japan. There prices fell

off four points in April 1920, the month of the Japanese crisis. In May the drop showed itself in France and Italy, and in June there was a slight fall in prices in the United States.

The Situation in the United States

This brings us to the economic events in the United States since the World War.

After a drop in the early part of 1919, an important boom began in the peace industries, which made up for the cessation in munition making. Prices in general, which had reached 206 in December 1918, after a brief fall to 197 in February, began a gradual rise to 207 in June. The next month there was a jump to 218, and in August to 226. In September there was a slight fall to 220, after which followed another gradual rise to 238 in December. This increase was kept up for the first part of 1920, and reached the peak in May at 272. This it will be remembered was the month after the Japanese panic. From that point prices dropped off slightly to 262 in July, then the fall became more rapid, reaching 250 in August, 225 in October, 207 in November, and 189 in December.

Thus after the war, prices in general in the United States took a two months' fall, followed by a fourteen months' rise, and another drop which has thus far lasted eight months.

There is sufficient variation in the different groups of products to justify particularizing. The price of metals and metal products, for example, averaged 208 in 1917, and dropped to 181 in 1918. In January 1919 they were 172. In January 1920 they were 177, then took a decided jump to 189 in February, and reached the high point after the war of 195 in April. They clung closely to this height for the next six months and were still 192 in September. Then a rapid drop began which brought them down to 184 in October, 170 in November, and 157 in December. Farm products which had averaged 220 in 1918, and 234 in 1919, reached 246 in January 1920, and again in April. There was a slight fall to 243 in June, and then a rapid drop which brought them down to 144 in December.

Food in general had averaged 189 in 1918, and 210 in 1919. During the last year it had risen steadily, reaching 253 in January 1920. After a slight drop to 244 in February there was another quick rise to 287 in May. This marked the peak, and was followed by a fall to 268 in July, and a still more sudden drop to 235 in August, 204 in October, 195 in November, and 172 in December.

One of the groups which mounted the highest was clothing. This averaged 239 in 1918, and 261 in 1919. It rose rapidly during the latter part of that year and in January, 1920, reached 350. Its high mark was at 356, during the next two months. It was, however, the first to feel the effect of the Japanese panic, and began a slow decline to 317 in July, and then a more rapid fall which brought it down to 220 in December.

The Rise in Wages

Wages in the meantime had been rising more or less proportionately to prices. During the war wages in the peace industries did not rise as fast as prices in general, but those in the munition industries leaped higher. Workers increased their pay by changing their jobs. After the war wages increased faster than prices and they have not yet dropped anywhere nearly as consistently as have prices. A comparison of the average weekly earnings in the factories in New York State and in food prices runs about as follows: 1914, food 105, earnings 98; 1915, food 102, with earnings 101; 1916, food 115, with earnings 114; 1917, food 147, with earnings 129; 1918 food, 170, with earnings 160; 1919, food 188, with earnings 185; 1920, food about 195, with earnings about 220. In November, 1920, food was 195, and earnings were 226.

An analysis of the average earnings in the factories in New York State discloses that in the metal, machinery, and conveyance group, wages increased to 229 between 1914 and the end of 1920. In the wood working factories, wages increased to 230; in the stone, clay, and glass plants, to 241; in printing to 204; in the paper mills to 244; in food and beverage establishments to 227; in textiles and clothing to 228; and in furs, leather, and rubber to 221.

In New York from 1914 to October, 1920, the union scales for the metal workers show an increase in the rate per hour to 212 for machinists; 182 for blacksmiths, 186 for boiler makers; and 179 for sheet metal workers. As a class, iron workers seem to have fared better than the carpenters whose wages in October, 1920, had increased only to 144 per cent of the 1914 figure.

In Boston the general average of union wages had increased from 100 as par, to 172 in July, 1920; while the pay of the metal workers and machinists had risen to 199.

The slump in prices has caused a reduction in wages in certain lines, but where prices have dropped some eighty points from their peak, wages, even where already directly affected, have dropped at the most only about twenty points.

The Unemployment Situation

But so many factories have been closed, and so many others have reduced their forces, as to give a percentage of unemployment in certain fields that is almost staggering. It was said that there were 3,473,000 fewer employed in January, 1921, than the year before. The number of unemployed reach 35 per cent in metals and metal products, textiles, and leather; in wood products 32 per cent, and 19 per cent in food products and in clay and glass products. It is even declared that these figures are too low.

The automobile industries of the Middle West showed the greater slump. Between January 1920 and 1921, employment in Michigan dropped 82 per cent, in Ohio and Indiana 40 per cent, and in Illinois 44 per cent. Connecticut showed a decrease of 43 per cent, Massachusetts 38 per cent, and New York 28 per cent. While it is too much to say that such a percentage of unemployment is equivalent to a drop in wages of this per cent, there is no doubt that the closing of factories, and reduction of forces in general predict a reduction in wages which will probably be found to bear a definite relation to the percentage of unemployment.

In considering what the future may bring one of the most obvious methods is to see what has happened in Japan where the fall in prices started first, and where the crisis has probably been worst.

After the break came there in March, 1920, raw silk dropped from 4,500 yen, down to nearly the pre-war level, or 900 yen per bale. Sugar, rice, and the cotton yarn made in Japan likewise plunged downward to nearly their previous level. The government instructed the banks to give the greatest possible assistance to

"such concerns as gave promise of substantial development and readjustment, and to business men who have carried on their business on a solid basis, and who are likely to develop it successfully if they are given the time necessary for adjustment."

Government controlled corporations were formed to hold up silk and rice, and 30,000,000 yen were advanced to the sugar interests. An attempt was made to peg silk at 1,500 yen per bale, but without conspicuous success, and sugar and rice have continued to drop. The situation in Japan at the beginning of the year, according to *Eastern Commerce*, published at Yokohama, is in part as follows:

"The condition of commerce and finance in Japan at the end of the year is undoubtedly bad. Any real recovery can hardly be expected early in the new year. The futility of trying to help business circles out of their depressed and disorganized condition by artificially keeping up prices is more than ever clearly shown by occurrences in Japan during the last few weeks of the year. For instance, silk fabric producers started an agitation to wind up the Imperial Silk Company which was recently floated with the help of the government and entrusted with the function of keeping up the price of raw silk. In the middle of December the Yokohama Exchange was reduced to a helpless condition, clearly showing the futility of trying to maintain prices at an unnatural level.

"Cotton mills have also had to admit the mistake of the policy of keeping up prices by means of the curtailing of production.

"The mistake is now being repeated by farmers.

"These few representative facts disclosed during the last few weeks, indicate that a general depression is being introduced in Japan, and it is apparent that prices must come down."

The same journal states that although the government pegged silk for export at 1,500 yen per bale, it is easy to purchase it for 1,100 yen.

The lessons from Japan appear to be that the end of the falling prices is not yet in sight, and that artificial attempts to prevent this fall will be useless and probably do more harm than good.

The failure of the state bank of North Dakota to hold up wheat prices is another indication of the same fact.

If then prices are still going down, how far will they go? Let us stop a moment and ask what has happened which should increase the price of goods over the pre-war level. Prices are increased primarily by demand. What new demand has been developed? Western Europe may have need, but cannot pay for them; Russia is, at least temporarily, out of the market; China is threatened with starvation; even South America is at present less able to absorb imports from us because her own exports to Europe are in less profitable demand. The one country which appears to be in a better condition for trade than it has for the past few years is Mexico.

There is no doubt, however, a greater latent demand in the United States than ever before. One proof of this is the fact that bank deposits between 1914 and 1920 increased about $18,000,000,000, an amount considerably more than the total United States debt with the loans to other countries subtracted. But the people of this country have shown pretty conclusively, in their consumers' strike, that they will not continue to pay war-time prices.

While prices are made principally by demand, the cost of the goods, in the case of necessities, indicates a minimum price. If nothing has happened to increase demand, what has taken place that will increase the cost of necessities? So far as the writer knows, only one thing, and that is the increase in wages. But while wages are hard to reduce they are by no means fixed at their recent high level, and are already showing a tendency to drop. Wages are themselves governed largely by demand and supply, and may be increased by the greater productiveness or the scarcity of labor. It is only fair to suppose that labor will be scarcer in Europe than before the war. For this reason, there is likely to be an important permanent rise in wages in Europe, which will result in bringing both wages and prices there to more nearly the level in the United States.

In considering the future, inasmuch as the demand in Europe is unquestionable and is nullified at present only by the inability to pay, there is no doubt that business will be better, as conditions in Europe improve. The payments on the German indemnity are very liable to create a boom in France, which may easily run into over-speculation, but will tend to hold up, at least temporarily, both prices and wages.

In the United States the increasing productiveness of labor, either through personal efficiency or improved processes, may at the same time assist in maintaining wages and in lowering prices.

The Outlook

In general, data which we have brought together suggest the following outlook. It will not take more than a year and a half from last May for industry once more to reach fairly normal conditions. This means that business should be reasonably good next winter. But prices in each industry will have to approach somewhere near the pre-war level before demand will be active and permanent. Inasmuch as the pendulum usually swings too far, prices will probably drop lower than they will remain. They will most likely find a level at about 30 per cent above pre-war prices. Industrial stocks were already below this level in December 1920 and farm products reached within 5 per cent of it in January 1921. General prices, however, though they dropped 95 points from May to January, would have to drop almost 50 more points to reach the level predicted. But this is only 28 per cent of the January average. Metal and metal products, which had dropped to 151 in January, would need to drop less than 20 per cent more to reach our estimate. Food would require only a 20 per cent fall from its January level of 163. Clothing, however, which was 208 in January, would still have to go down 37 per cent before reaching our estimated stable basis.

Funds may be used with caution to ease the fall, but if they are employed to keep prices high the result is almost sure to be failure, and the effect disastrous.

Wages also will drop, but they will do so more slowly than prices and in many cases only when it is absolutely necessary to reduce them in order to produce goods for a price at which they can be marketed. In the industries where circumstances are most favorable to labor, wages may remain at an average of possibly 40 or 50 per cent above the pre-war level.

As for the years following 1921, business will depend very largely upon the progress made in the reconstruction of Europe and the revival of our foreign trade.

Apprenticeship System of the Southern Pacific Railway

Obtaining Good Mechanics by Training Them —Methods of Instruction—Rates of Pay While Learning—Summary of Periods of Instruction

BY FRANK A. STANLEY

THE apprenticeship system of the Southern Pacific Co. has been in successful operation for a number of years in the various shops of the company. The term of apprenticeship is four years, the first six months being a probationary period during which a boy's fitness for his chosen work is to be determined. In the selection of apprentices, applicants are given an oral and written examination by the superintendent of apprentices and must pass this examination in addition to the regular physical examination. The range of ages for applicants is between 16 and 22.

FIG. 1. APPRENTICE SCHOOL IN SACRAMENTO SHOPS

The apprentice board is composed of the general foreman of the department, the shop foreman, and the apprentice and school instructors, and this board passes upon the fitness of all boys in the probationary period, so that if any are found lacking in aptitude or other qualifications, they may be eliminated from the apprentice courses.

The rates of pay during the four-year apprenticeship are advanced every six months. The range is as follows:

First year,	First six months,	42 cents per hour
	Second six months,	44½ cents per hour
Second year,	First six months,	47 cents per hour
	Second six months,	49½ cents per hour
Third year,	First six months,	52 cents per hour
	Second six months,	54½ cents per hour
Fourth year,	First six months,	59½ cents per hour
	Second six months,	67 cents per hour

At general shops and wherever there are a sufficient number of apprentices to warrant it, apprentices are under the direction of a superintendent of apprentices. He keeps a record of all apprentices and sees that they receive proper instruction in their work and that the instruction is varied in accordance with the regular schedule of shop training. While he does not have direct authority over the work of the apprentices in the shops, he takes up and arranges with the foreman all matters pertaining to any desired changes affecting the apprentices. At shops where there are only a few apprentices, a foreman or assistant foreman acts as head instructor of apprentices. All apprentices are required to attend the schools of instruction for four hours each week, held within the shops, during working hours. They are paid straight time for the period spent in school. Attendance at the school is continued throughout the four years of apprenticeship. The school year is divided into two terms of 21 weeks each, there being eight weeks during July and August and two weeks during the Christmas and New Year holidays when the schools are not in session.

This schedule of shop training is followed in all shops on the system: First two years on machines; third year on erecting floor; fourth year on erecting floor or on machines, according to qualifications of the apprentice.

At the end of the second year, apprentices so inclined, may, with the consent of the apprentice board, be assigned to airbrake work or toolmaking for the remaining two years.

The accompanying report gives in tabular form data pertaining to the activities of the apprentice schools at the different shops of the system. This report is for the month of January, 1921, but a summary will be found in the section showing the activities since 1912.

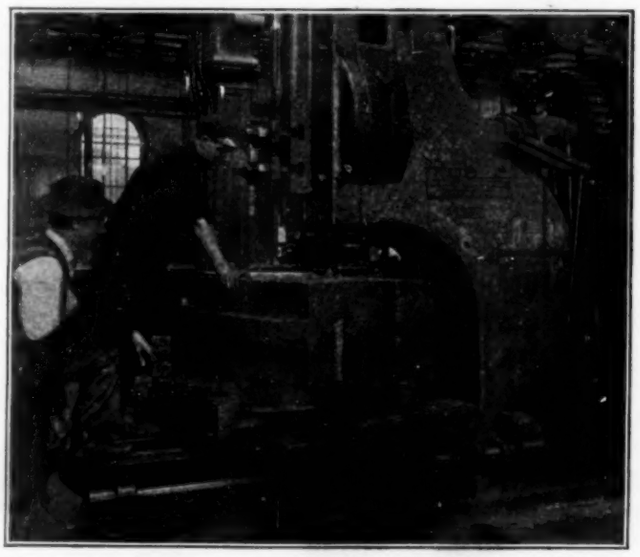


FIG. 2. MACHINIST APPRENTICE RECEIVING INSTRUCTION ON SLOTTER

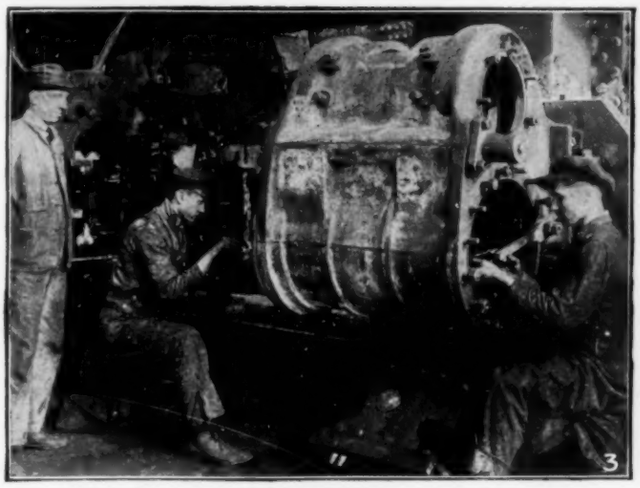


FIG. 3. LEARNING HOW TO ALIGN GUIDES. FIG. 4. SETTING VALVES UNDER INSTRUCTION

COPPERSMITHS, TINSMITHS, AND PIPERS (CAR DEPARTMENT)

Helping mechanic (piping work and toolroom)	2 months
Water system, cars	3
Gas system, cars	3
Steam system, cars	4
Air system (including test rack)	6
Locomotive boiler and engine piping	2
Locomotive air piping	4
Locomotive copper work (piping, gaskets, etc.)	6
Helping mechanic (general tinsmith work)	2
Working at bench with mechanic (tinsmith work)	2
Working at bench alone (tinsmith work)	4
Dining car work	6
General jobbing work on cars and in shop	4
	48 months

CABINETMAKERS

Helping machine hands	3 months
Light common work at bench	6
Office furniture, etc	9
Getting out material in mill	6
In car shop as car builder	6
In cabinet shop on general work	6
In car shop on inside finish	6
In cabinet shop on general work	6
	48 months

COPPERSMITHS, TINSMITHS, AND PIPERS (LOCOMOTIVE DEPT.)

Helping mechanic (piping-work and toolroom)	2 months
Locomotive boiler and engine piping	6
Locomotive air piping	9
Car piping (water, gas, steam and air,) 1 month each	4
All classes piping, general, stationary and air	3
Locomotive copper work (piping, gaskets, etc.)	6
Helping mechanic (general tinsmith work)	2
Working at bench with mechanic (tinsmith)	4
Working at bench alone (tinsmith work)	4
Car (copper and tinsmith work)	4
General floor work (copper and tinsmith work)	4
	48 months

DETAILED SCHEDULE OF MACHINE WORK

Small lathe	3 months
Large lathe	3
Turret lathe	2
Planer	3
Shaper (crank)	2
Shaper (draw cut)	2
Milling machine	3
Boring mill	3
Drill press	1
Slotter	2
	24 months

SOUTHERN PACIFIC COMPANY
Pacific System
REPORT OF APPRENTICE SCHOOLS, MONTH OF JANUARY, 1921

Craft	Oakland	Sacramento	Roseville	Sparks	Ogden	Dunsmuir	Brooklyn	Albany	Marshfield	Dallas	Roseburg	Beaverton	San Francisco	San Luis Obispo	Bakersfield	Los Angeles	Tucson	Shipyard	Total
Machinists	18	89	11	23	25	11	12	2	..	3	2	..	29	2	12	57	2	3	301
Boilermakers	5	25	4	5	6	2	3	..	..	..	1	..	10	4	3	16	....	....	84
Blacksmiths—A	..	10	....	1	2	1	....	..	..	..	..	..	....	..	....	3	....	....	17
Sheet-metal workers—B	2	20	1	4	4	2	1	..	..	..	2	..	6	2	1	14	....	....	59
Electrical workers	3	3	1	3	2	1	....	..	..	..	..	1	2	..	....	3	....	1	20
Carmen—C	1	47	....	4	1	....	2	..	..	..	..	..	2	..	....	32	19	1	109
Molders	..	14	....	....	....	....	....	..	..	..	..	..	....	..	....	....	....	....	14
Total, Jan. 31, 1921	29	208	17	40	40	17	18	2	..	3	5	1	49	8	16	125	21	5	604
Total, Dec. 31, 1920	24	209	17	39	40	18	18	2	..	3	5	..	50	8	15	116	21	5	590
Total, Jan. 31, 1920	47	229	17	56	54	18	18	2	..	2	3	..	41	16	18	142	56	2	721
Activities during Jan., 1921:																			
Percentage of attendance	13.0	93.5	89.6	87.0	98.0	95.0	94.0	†	†	†	†	†	96.0	†	81.0	90.0	100.0	71.0	.....
New apprentices employed	7*	2	....	4*	3*	....	....	..	..	..	..	1	....	..	2	14	....	....	33
Resigned	....	3	....	1	....	....	....	..	..	..	..	..	....	..	....	1	....	....	5
Discharged	....	....	....	....	....	1	....	..	..	..	..	..	....	..	....	3	....	....	4
Transferred (to or from)	....	....	....	....	....	....	....	..	..	..	..	..	....	..	....	....	....	....	.....
Graduated, Jan., 1921	2	....	....	2	3	....	....	..	..	..	..	..	1	..	1	1	....	....	10
Graduated, Dec., 1920	1	2	1	....	2	....	1	..	..	..	..	..	....	..	....	2	....	....	9
Activities since Jan., 1912:																			
Total employed	364	1,058	69	252	276	74	75	13	..	16	7	3	179	64	108	810	265	57	3,690
Total graduated	39	207	21	41	47	8	26	1	..	3	..	..	20	..	4	117	24	5	563
Per cent graduated	....	....	....	....	....	....	....	..	..	..	..	..	....	..	....	....	....	....	15.25
Total grad. still in service	15	150	18	28	36	7	11	1	..	1	..	..	15	..	3	103	20	1	409
Per cent grad. still in service	....	....	....	....	....	....	....	..	..	..	..	..	....	..	....	....	....	....	72.64
Graduates re-employed	14	26	....	2	2	....	....	..	..	..	..	..	....	..	....	....	....	....	44

A—Includes Springmakers. B—Includes pipers, coppersmiths and tinsmiths. C—Includes cabinetmakers, car builders, carpenters, painters, patternmakers and upholsterers. † No school during January. * Shows apprentices laid off who returned to work.

BOILERMAKERS

Heating rivets	1 month
Toolroom	1
Sheet-metal working	3
Bracing boilers	6
Tank shop	3
General riveting	3
Chipping and caulking	3
Flange turning	3
Fitting up	6
Erecting shop (general repair work)	10
Round house and running repair work	3
Laying out bench	6
	48 months

ELECTRICIANS

Helping electrician around shop	6 months
Car wiring and wiring repairs	12
Wiring buildings and car wiring installation	12
With electrician on axle lighting equipment	6
Locomotive wiring	6
With electrician on motor repairs and installation	6
	48 months

BLACKSMITHS

Helping (small fire)	6 months
Small fire (without helper)	6
Car forgings, blacksmith tools, etc	12
Locomotive work of medium weight and machine-shop tools	12
Average grade of work in shop, including heating and forging heavy material	12
	48 months

PATTERNMAKERS

Caring for machinery, making dowel pins, planing wood fillets, making glue, keeping material in order, helping mechanics at machines	6 months
Simple lathe work, sand papering, varnishing patterns, helping mechanics by jointing and gluing up stock	6
Helping molder in general foundry	9
Working with mechanic on general work in pattern shop	15
Working alone on general work	12
	48 months

MOLDERS, GENERAL FOUNDRY

Core room	12 months
Helper molder at loam work	6
Dry sand work, locomotive cylinders	6
General floor work	12
Green sand molding	6
General all round work	6
	48 months

CAR BUILDERS

Common work around cars, such as repairing fish racks, underlining, floors, etc	12 months
With mechanic on such work as side door steps, baggage car siding, roofing and inside lining	6
Platforms	6
Passenger car sheathing, framing of cars, on steel work, placing of underframes	6
Sheathing, dressing and surfacing	6
General car building	6
Laying out steel work, and placing steel underframes	6
	48 months

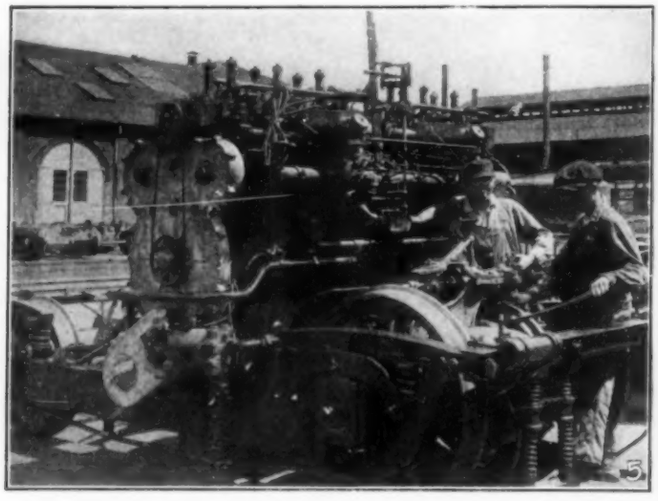


FIG. 5. WORKING ON A MOTOR-CAR ENGINE.

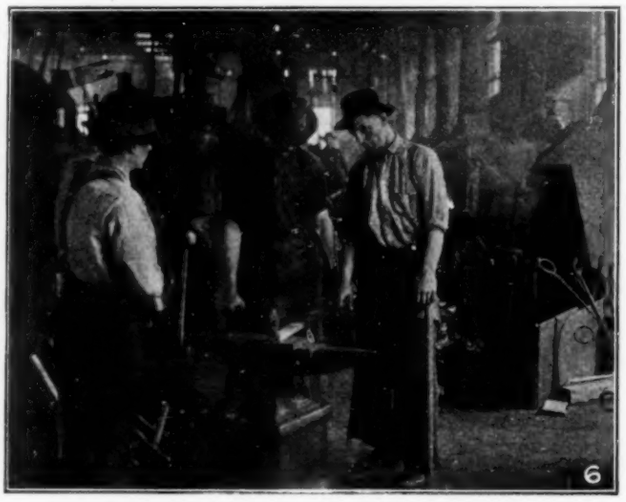


FIG. 6. BLACKSMITH APPRENTICE LEARNING TOOL DRESSING

FIG. 7. FIRST-HAND INSTRUCTION IN MOLDING.

FIG. 8. A BOILERMAKER APPRENTICE AT THE LAYOUT BENCH

MOLDERS, BRASS FOUNDRY

Core room	6 months
Third-class work	12
Second-class work	12
First-class work	18
	48 months

ERECTING FLOOR WORK

Valves (including all work pertaining to valves)	6 months
Shoes and wedges	3
Frames	2
Cylinders	2
Cab work	2
Spring rigging	2
Brake rigging	2
Boiler fittings	2
Injectors and lubricators	1
Guides	2
	24 months

The courses for upholsterers and car painters are similarly of 48 months each, but details are not included in this article.

The illustrations are from photographs taken of apprentices in school and in the shops. The illustration, Fig. 1, is a view in the school at the Sacramento general shops. The next view, Fig. 2, shows a machinist apprentice with instructor, the work in hand being underway on a vertical slotter. In Fig. 3 two apprentices are aligning guides under instruction. An apprentice engaged in setting valves under the direction of the instructor is represented in Fig. 4, and in Fig. 5 two boys are shown at work on a motor car engine.

In Fig. 6 is shown a blacksmith apprentice receiving instruction in tool dressing. The foundry view, Fig. 7, illustrates the method of giving molder apprentices first-hand instruction, and the final illustration, Fig. 8, shows a boilermaker apprentice working on the layout bench.

Purchasing Technical School Equipment

BY A. W. FORBES

On page 870 of the *American Machinist*, J. R. Camm advocates the purchase of first-class equipment for trade and technical schools, and he presents some arguments that sound reasonable. I can agree with him that there should be one first-class machine of each kind, so that each pupil would have the chance to try it before graduation; but when it comes to using first-class equipment throughout the school, there are as many objections as points in favor, aside from expense.

If the trade school is to teach principles, a poor machine is usually better than a good one. Take the subject of chatter for example. A light lathe will chatter on any possible excuse, and will give practice in grinding and setting tools so as to avoid the chatter without reducing speed, which it is impossible to get on a rigid machine. The effects and causes are on so large a scale that the student can see them.

Again, if all the bearings and the ways are in good condition, how is the student to get practice in making allowance for the faults of the machine? The skilled toolmaker working to 0.0001 in. has to consider the weakness of the machine even with the best, but if the machine is more accurate than the boy's hands, he is liable to look upon the machines as perfect, and to expect them to turn out the work without the aid of brains.

It is difficult for one who is experienced with good machines to do good work with poor ones, but to go in the opposite direction is easy.

Want Ads—Discussion

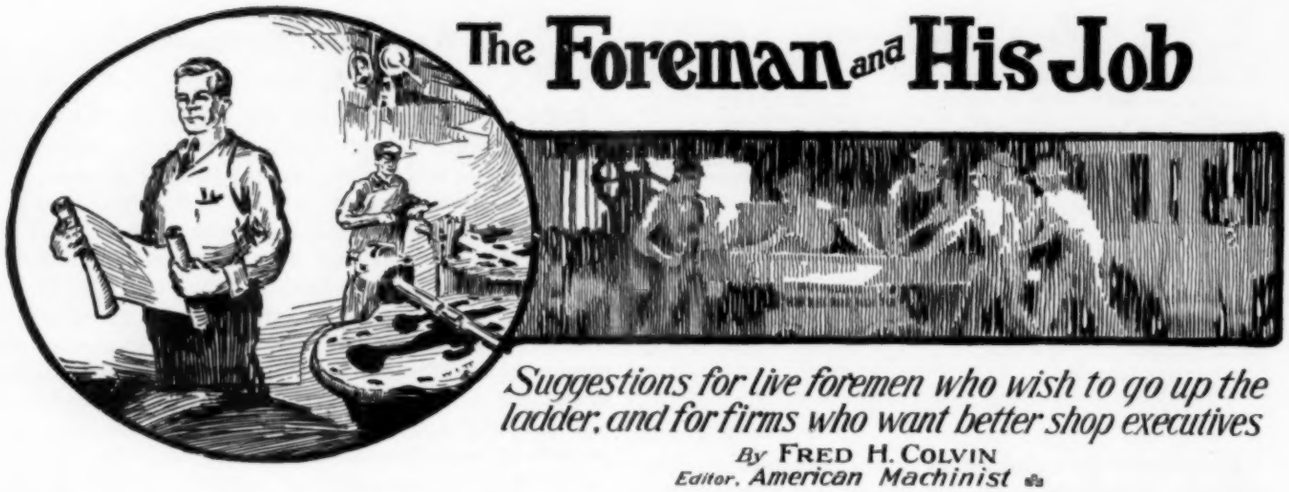
BY A. SPALDING

Referring to the article of Charles F. Smith on page 103 of the *American Machinist* and various discussions both previous and current on the subject of want ads, it may be interesting to consider the impressions and experiences gained from contact with both sides of the subject. It is surprising how the opposite viewpoint will enlighten one on points not hitherto given consideration and applications to blind ads are no exception. The blind "Help Wanted" ad seems to be employed more commonly than would seem justified with the possible exceptions that the advertiser may wish to avoid the annoyance of a swarm of applicants in person during periods of general unemployment and with the intention of avoiding the necessity of replying to each application, which seems to be the general custom. There may be other reasons, but it would seem that they are more imaginary than real. Generally speaking, it would appear that a more desirable applicant will reply to an "open" advertisement as he has more assurance in applying to a known concern and can judge in a measure if the position is sufficiently attractive to justify an application without wasting more of his time or that of the advertiser.

In the writer's experience of some twenty years a number of applications have been submitted to blind ads and replies were received to but a very limited number; barely sufficient to justify the time and labor of preparation and certainly not sufficient to justify the possible inconvenience to those who had been named as references.

On the other hand the writer has been guilty of resorting to the use of the blind help-wanted ad and took full advantage of the opportunity of avoiding replies to applicants with the exception of applications enclosing photographs of value, which were returned. However, the enclosing of a valuable photograph cannot be assumed to be a guarantee of a reply.

The real enlightenment of inspecting a number of applicants is derived from the reactions that each one has on the recipient. We must first consider that the application is the representative of the applicant and is the only immediate means of judging his fitness, and as it is a matter of selling his services, a business-like application is received with more favor than one carelessly composed. To be exact, a good quality of standard unruled 8½ x 11 in. business paper is preferable to any other such as paper suited to social correspondence or low-grade odd size paper, such as is usually sold in pads or blank books. Remember that you are supposedly writing a business letter to an employer accustomed to business correspondence, and a letter of application that does not conform gives a bad impression. Improper spelling is almost fatal, and a typewritten letter is half the battle. The composition of the application represents the sales talk, which may or may not appeal to the recipient and is a subject too broad to be covered intelligently in a short article, but generally speaking the applicant must state his fitness fully and concisely. A photograph is a great help in gaining an idea of an applicant and assists greatly in making the application equivalent to a personal interview.



The Foreman and His Job

Suggestions for live foremen who wish to go up the ladder, and for firms who want better shop executives

By FRED H. COLVIN
Editor, American Machinist

WE TALK a lot about psychology these days. But most of us would have a hard time defining just what it is in language that would mean anything to a man who didn't already know what we were talking about. It's much easier to think of it as horse sense in understanding human nature, in trying to understand how the other fellow looks at things in the shop.

First of all we've got to drop the notion that all men are alike and that what we call "plain English" means the same to different nationalities. Some are temperamental, other stolid. Some are used to bargaining. They have been forced to become traders and to drive close bargains, just as men in certain parts of our own country have developed into traders of jack knives, horses and now—tin Lizzies.

These differences must be remembered when setting rates, when making changes in schedules and in other ways. Some of the temperamental races do not know how to bargain. If they think a piece of work is worth 60 cents and you say it is only worth 50 cents, they consider it a personal accusation. They feel that their honesty has been assailed, that you accuse them of lying. Men of other races and sections will be happier if they get 50 cents by splitting the differences between 40 and 60 than if you offer them 50 cents at first.

This does not mean that you must have several entirely different methods of dealing with men in the same shop. But it does mean that you must consider the differences in the men in presenting new ideas of any kind. They must not be presented so as to antagonize any group if it can be avoided.

GOETHALS' SUNDAY MORNING COURT

We all know how well General Goethals handled the Panama Canal Zone during the building of the great canal. One of his customs was to hold a sort of court every Sunday morning where any person in the Zone could come and discuss any problem there. He formed a sort of grievance committee for the Zone. And the lowliest laborer of any nationality could get a hearing as readily as an official.

That was a place to unburden the soul of any kind of a grouch or grievance, and many petty annoyances and abuses were wiped out at that court. In many cases it was only necessary to explain the reason for what appeared to be an injustice, and the air was immediately cleared. It furnished a safety valve where fancied wrongs could be aired and the temperaments of different races given full recognition. Goethals understood human nature, whether he could define psychology or not. And this understanding probably had about as much to do with his success as his engineering ability. The combination gave us a piece of work which will stand long as a monument to his memory.

Try to understand the men you have to deal with. Try to get their viewpoint, to see what sort of things

TELLING IT TO THE GENERAL

appeal to them, interest them and secure their co-operation. This is just as important as your technical knowledge of the business. Some contend it is the biggest asset a foreman can have.

THE DREAD OF CHANGES

There is another point which every foreman should put away in his memory to soak, and not let it get too far in the background either. It should be taken out and dusted every time he wants to make a change in methods of any kind. And this point is that nearly every one dreads, or is in fear of a *change*. It is the *unknown* which looms up as a barrier to new things of any kind.

Most people, unconsciously or otherwise, look askance at a change of almost any kind. They dread to tackle a new job; to move into another house; to go to a new town. They know the bad or disagreeable things of the old one, but who knows but what the new may be even worse?

A case came up in the clothing trade regarding the counting of the day's work. The men were told by their representative that the firm had a perfect right to count the work—that there was nothing to fear. The answer is worth considering. "We don't really object to counting the work. What we fear is what may be in the boss' mind when he asks to have it counted. He never asked us before and he must have something up his sleeve or he wouldn't ask us to count it now."

Suspicion and objection to change have been at the bottom of most labor disputes and their attendant evils. Opposition to new methods, violence and the destruction of new machinery, can all be laid to the same cause. Even admitting that it is foolish, isn't it better to pave the way for changes by establishing confidence and even to spend considerable time showing the reasons for the change, than try to force changes through regardless of the attitude of the men? The most economical production cannot be secured with antagonism among the workers. Even if they do meet your schedules under such conditions you can be sure that these schedules can be greatly exceeded by securing real co-operation.

SATISFIED WORKMEN GIVE THE AGITATOR THE "GO-BY"

Pave the Way for Changes

It is always best to pave the way for radical changes by a campaign of education. The time spent will be well repaid by increased production, and a better feeling in the plant. Show just why the changes are to be made and what they should accomplish. Just put yourself in the other fellow's place and see if you wouldn't respond better if you were told the reasons for new methods. Also try to remember that as foreman your experience has given you a broader vision of manufacturing and of life in general than the worker in the shops.

Study your men. Learn what appeals to the different types and how to reach them. Play fair—be sympathetic and interested in their troubles and their ambitions. Technical knowledge alone will not make a successful foreman or superintendent. A knowledge of the habits and thoughts of men is even more necessary.

Drafting Room Notes

By John S. Watts

If they had to work in the machine shop, using their own drawings, the majority of draftsmen would be disagreeably surprised at the amount of information which could and should be incorporated on the drawing, but is not, and therefore has to be dug up by the machinist. That the drawings being turned out now are, in this respect, much superior to those made in earlier times cannot be denied, but there is still room for much improvement.

Take for example the dimensioning of so simple a thing as a tapped hole for a stud. In the majority of cases, after giving the dimensions necessary to locate the center line of the hole, the draftsman is content with merely specifying the diameter of the tapped hole. The machinist who drills and taps these holes has to decide what size drill to use, how deep to drill the hole, and how far the stud should project when screwed home. This last item often involves the machinist having to spend considerable time locating the part to be held by the stud, and measuring the thickness of its flange. This information can be quite easily put on the drawing, as indicated in Fig. 1, and in a very few words give all the data that are required to drill the hole, tap it, and screw in the stud. If, in addition, the drawing has a bill of material on it, giving all the studs, bolts, etc., that go with this part, it may be considered really complete in so far as this phase of the matter is concerned.

It would be desirable to have the draftsmen occasionally work to their own drawings in actual production in the shop, but as this is hardly practicable, the next best idea is for the draftsman to check his drawing by making the part shown, in imagination, thus assuring himself that the information necessary to perform each operation is clearly shown on the drawing. This studying out of the work to be done in producing the part will very often bring to light a difficult operation which can be simplified by some slight alteration in the

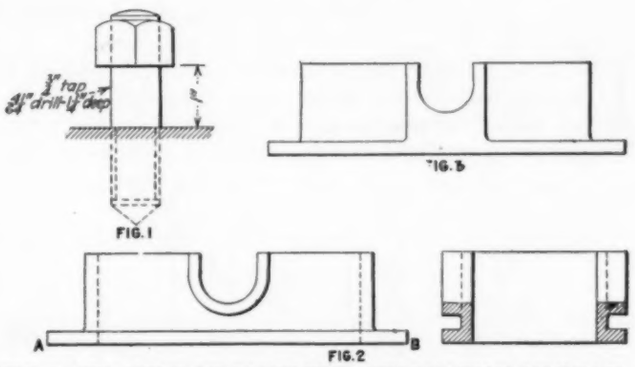
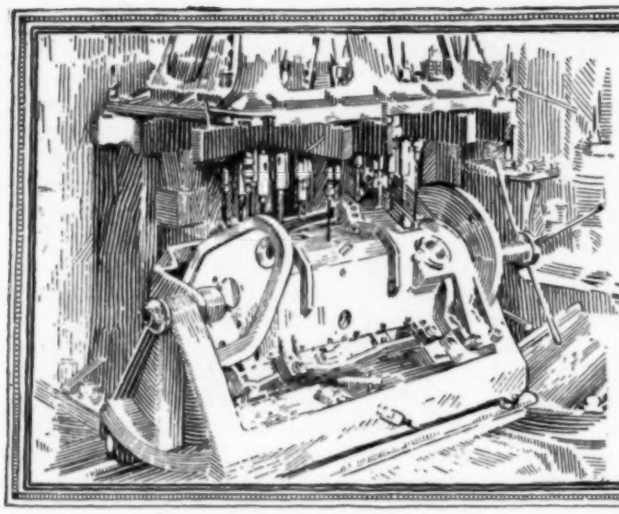


FIG. 1. EXAMPLE OF COMPLETE INFORMATION ON DRAWING. FIG. 2. DESIGN OF CASTING NECESSITATING CORES. FIG. 3. SAME CASTING WITHOUT CORES

design, and will almost always lead to a more economical design than will be produced if this study is neglected.

Especially in the matter of castings is the average draftsman likely to turn out designs which are more costly than they need be, as few draftsmen are as familiar as they should be with the methods used in molding. By forming a habit of studying out what the method of molding will be on each piece that he designs, and when unable to decide this himself, consulting with the molder, he will soon be able to design castings that will be cheap to make, besides accumulating a fund of information that will make him of more value to his employer.

To illustrate this point, we may take a common example as shown in Fig. 2. This casting would be made with the parting at line *AB*, leaving its own core inside. The bosses on the sides cannot, however, be withdrawn from the mold, and would require the making of two cores. This could be avoided by making the casting as shown in Fig. 3, which would require no core work of any kind. It would, however, weigh a trifle more than the casting shown in Fig. 2. In the example taken, the cost of the extra metal would be considerably less than the cost of making and handling the two cores. Consideration should be given to this cost, however, as it will happen in some cases that the metal saved by coring will repay the cost of the cores, when the weight saved is great or the metal high in price.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Albert A. Dowd Engineering Co., New York City

Drill Jig Design Continued—Principles and Methods of Indexing—Index Plungers and Latches—Combined Index and Latch—Specific Examples of Indexing Jigs

IN DISCUSSING the methods used in indexing various fixtures for drilling we must first consider the matter of accuracy. It must be remembered that indexing surfaces, plugs, bushings, wedges or any other members which are used to locate from in the process of indexing should be kept as free from chips and dirt as possible in order that the indexing may be accurate. This is a fundamental point which must always be thought of by the designer. Let us refer to Fig. 90, in which two indexing plugs are shown at *A* and *B*. The design shown at *A* has a plug which is located radially so that it will enter the index plate *D* as far from the center *E* as possible. It may even be advisable to make a very large index plate for a comparatively small index jig if the accuracy required is great. In example *B* the plug *F* is quite close to the center *G* so that any errors in indexing would be multiplied in the work in direct proportion to the distance of the surface being drilled from the center *G*.

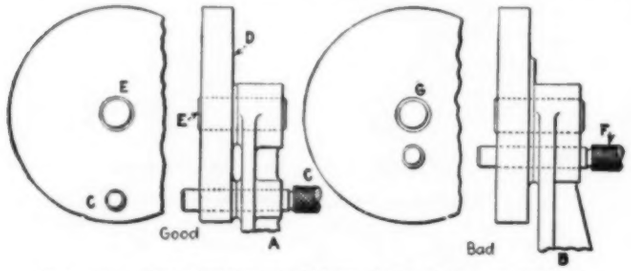


FIG. 90. EXAMPLES OF GOOD AND BAD METHODS OF LOCATING THE INDEX PIN

It may be taken as a general principle that the further away from the center the indexing pin can be located the more accurate the work will be.

Index Plungers and Latches

When an indexing jig is rotated into its various positions there must be a positive method of location provided for each position. There are a number of methods in common use, some of which are illustrated in Fig. 91. The simplest type of indexing pin is shown by the first sketch. *A* is the indexing member and *B* is the fixed member. Each of them is provided with a hardened bushing, at *C* and *D* respectively, in such alignment that the plug *E* can be pushed into them to form a lock as the various indexing positions are used.

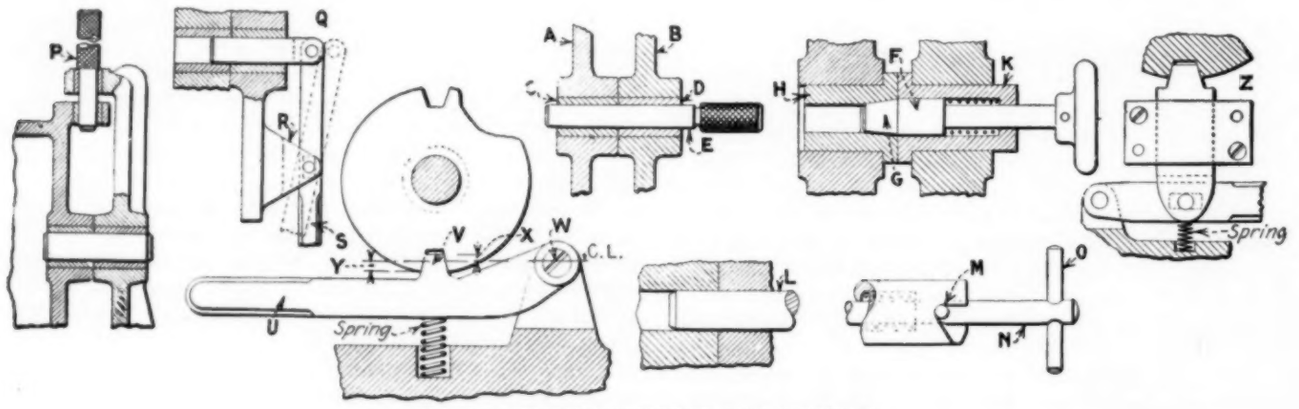


FIG. 91. INDEX PLUNGERS AND LATCHES

An objection to this form of indexing is that the plug is a loose piece which may be easily lost; it may, however, be attached to a piece of closet chain and fastened to the fixed member. It can also be arranged with a special bushing and a spring to keep it in place.

Another form of indexing plunger, shown at *F*, is

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used by many designers and has much to recommend it. The plunger is tapered at the end and seats itself in the tapered end of the bushing *H*. It has a long bearing in the bushing *K* and is provided with a spring to hold it in position. Some designers prefer a straight pin instead of a taper, as indicated at *L*. The writers believe that this is a matter of personal preference although it is claimed that a taper plunger will adjust itself for wear when the straight plunger will not. Care must be taken in designing a tapered plunger, and the sides should not taper more than 10 or 12 deg. on each side of the center line.

In some cases it is necessary to use a heavy spring for holding a plunger in position; a construction that requires considerable pulling on the part of the operator. This can be remedied by inserting a pin in the stem of the plunger as indicated at *M* and then cutting a cam-path on the end of the bushing at *N*.

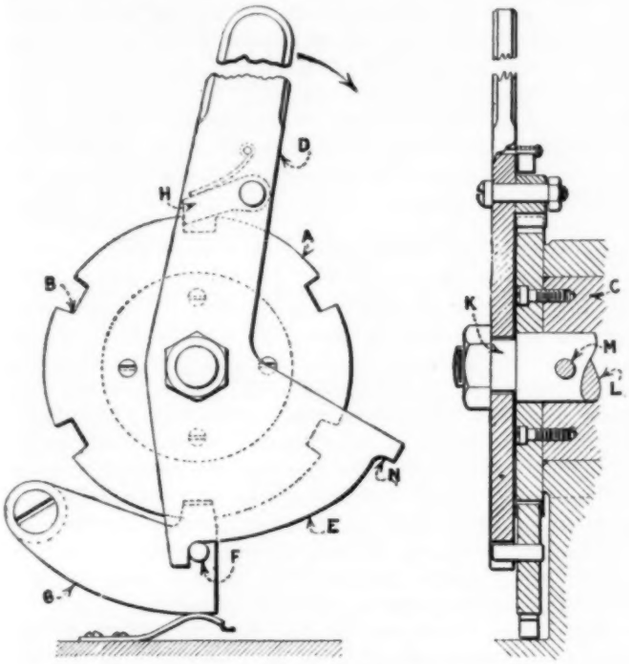


FIG. 92. COMBINED INDEX AND LATCH

The insertion of a rod handle at the end *O* makes it possible to pull out the plunger by a turning action, much easier than a straight pull.

A form of index which is much in use on large work and which has the advantage of placing the pin as far as possible from the center, is shown at *P*. There is no particular comment to be made on this method except to say that it is good.

On large trunnion jigs it is often difficult to operate a pull-pin by means of a knob and it is much more convenient for the operator to provide a lever. An example is shown at *Q*. A lug *R* is attached to the base of the fixture to act as a fulcrum for the lever *S*. The fulcrum should be so placed that the length of the lever will permit the operator to withdraw the pin easily. It is evident that an elongated slot must be provided in the lever or the index pin to take care of radial movement when a spring is used. Many times it is desirable to use a steel plate instead of a bushing as an index plate, as shown at *T*. In one of two methods that are common practice, the lever, as shown at *U*, is formed at *V*, so that it will seat itself in the

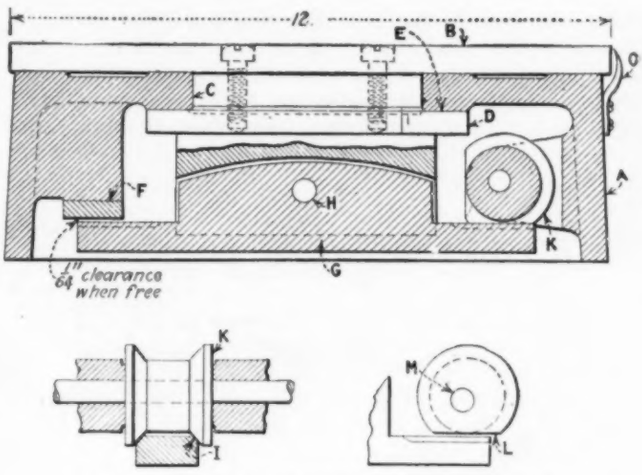


FIG. 93. INDEXING TABLE FOR DRILLING

angular slot in the steel disk *T*. When an arrangement of this kind is made the designer must be careful to position the center *W* so that the distances *X* and *Y* will be equal in order that the angles on the lever will coincide with the angles on the disk.

The other method is shown at *Z*. The plunger is mounted in a slide and is operated by a lever. The second method is to be preferred on account of its greater accuracy but space will not always permit its use. Care should be taken that the plunger is given a long bearing in the slide in order to obtain accuracy.

Combined Index and Latch

In indexing fixtures for high production work and in other designs of indexing fixtures it is desirable to make a very quick operating index and latch, one which will be so nearly automatic that a man can operate it rapidly and without giving it much attention. Such a latch is shown in Fig. 92. This form can be used in many cases and can even be arranged so that the movement of the drill press spindle as it passes up after drilling the work will index the fixture. A steel disk *A*, having a number of index slots *B*, is mounted on a center plug *C* to which the body of the jig to be indexed is attached. The lever *D* has a cam cut on it at *E*, this cam being used to control the movement of pin *F* in the latch *G*. The lever is provided with a dog *H* which engages with the edges of the various index slots. The lever itself swings freely on the bearing *K* which is a part of the stud *L*, fixed in the member *C* by means of the pin *M*.

In operation, when the lever is moved in the direction indicated by the arrow, the pin rides up on the cam thus pulling the latch out of the slot until restrained by the shoulder of the cam at *N*. At this

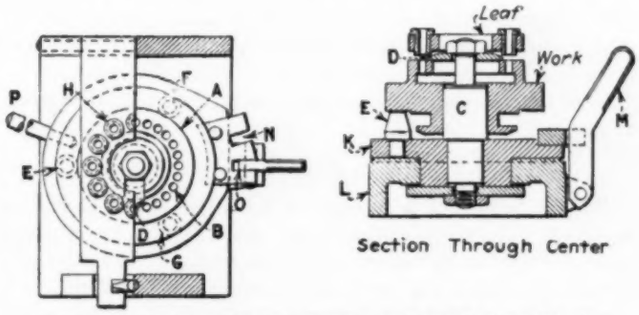


FIG. 94. INDEXING JIG FOR A NUMBER OF HOLES CLOSE TOGETHER IN A CIRCLE

point the dog drops into the slot and the lever is moved in the opposite direction until the latch drops into place once more, thus completing the indexing. This principle can be applied on both large and small jigs, preferably for indexing from four to eight stations. All of the working parts should be hardened to insure long life and accuracy.

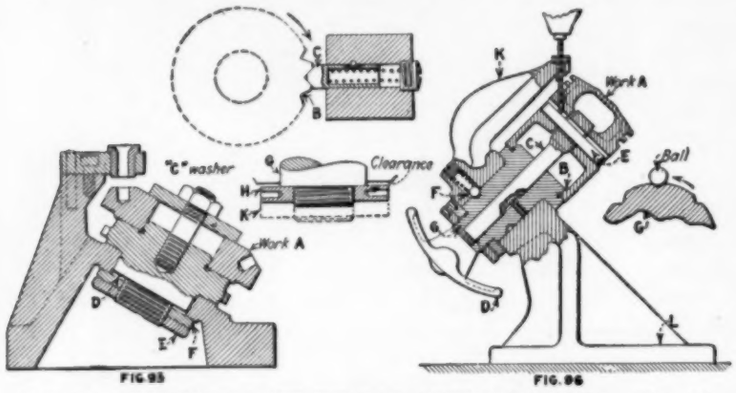


FIG. 95. INDEXING FIXTURE FOR ANGULAR HOLES. FIG. 96. INDEXING JIG FOR ANGULAR HOLES IN A PISTON

In Fig. 93 is shown a form of indexing table which can be made up and carried in stock. It can be used for many purposes requiring a rapid and accurate index. Frequently, indexing of a number of holes is desirable and yet the number of pieces to be made is small, or for some other reason it does not seem advisable to make up an indexing fixture. In cases of this kind an index table can be used to advantage. A circular cast-iron base *A* has been faced on the upper surface and fitted with a table *B*, having a center bearing by means of the plug *C* to which it is firmly screwed. The plug has a flange *D* fitted to run freely against the surface *E*. A hardened shoe *F* is attached to the fixture at one side. The lower part of the bearing plug is slotted to receive the index rocker *G* which is pivoted loosely on the pin *H*. The upper surface of the rocker is beveled to the form shown at *I*. This bevel surface acts as the index for the plate when acted on by the spool *K*. The form of this spool is shown clearly in the diagram *L*, and it will be noted that the flatted side allows clearance for indexing. A great advantage in this type of indexing mechanism is the fact that there is clamping action of the rocker against the hardened block.

In the particular instance illustrated, the device is made for indexing to 180 deg., but the same principle can be used for various numbers of index spacing by making suitable modifications in general construction. The cam *K* can be operated from outside the fixture by means of a simple lever attached to the pin *M*. An approximation of the indexing used can be determined by reference to the pointer at *O*. The advantages of this device are that it is accurate, very rigid in construction and all the working parts are protected from dirt and chips.

Index Fixture for Holes in a Circle

We referred to a condition in Fig. 83 in which a number of holes were drilled so close together that drill spindles could not be spaced close enough to drill them all at once, and we showed a method of handling such a condition. The holes were arranged in rectangular form. We will now consider indexing jigs arranged for a group of holes so spaced in a circle that it is not possible to set the spindles of a drilling machine close enough together to drill them all at one time.

Such a condition is shown in Fig. 94, the work being shown at *A* and the holes indicated at *B*. In this jig the work is set up and located on a central plug *C* and clamped in position by means of a C-washer *D*. It rests on the three pins *E*, *F* and *G*. The bushings are spaced for alternate holes as indicated at *H*. The stud on which the work is located is mounted in a revolving plate *K*, supported by the base *L*. Indexing is done by means of the lever *M* which engages with the slots *N* and *O* in a hardened plate. Another lever *P* is used to swing the index plate from one position to the other. This is a very good example of an index jig to take care of a condition such as that frequently found in the main driving shaft clutch gear of an automobile. There are many other cases when a jig of similar form can be used, as the general simplicity of the construction makes it readily adaptable to a variety of conditions. Any one of the several methods could be used for indexing instead of the one shown. It is advisable to provide some means of fastening the jig down to the drilling-machine table.

Index Fixture for Angular Holes

The fixture shown in Fig. 95 is an indexing drill jig for a series of blind holes drilled at an angle in the work *A*. Great accuracy in the location of the holes is not of supreme importance, and therefore a method of indexing can be used which will give approximate locations but not to exact dimension. The index plate has a series of notches cut in it at *B*, spaced in such a way as to give the correct spacing for the drilled holes. A spring plunger *C* with a rounded end is mounted in a block so that the plunger engages the notches in the index plate. A weak spring should be used when a design of this kind is made in order that the indexing may be as easy as possible.

The index plate can be mounted in either of two ways: As shown at *D* it is held in place by the two locknuts *E* and *F*, which are adjustable to permit regulation of the pressure on the bearing and adjustment for wear. A more common method of mounting is shown at *G*, where the stud is fitted so that it comes through the hole a few thousandths and is fastened by

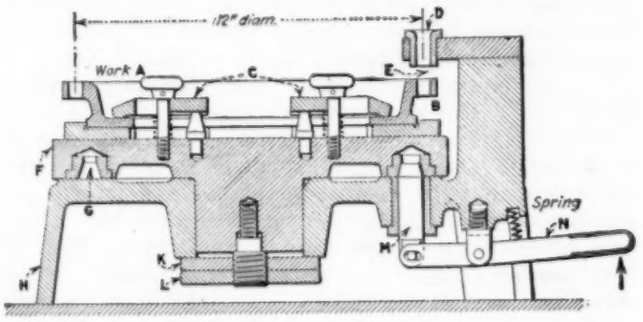


FIG. 97. INDEXING JIG FOR AN ANNULAR RING

one or two nuts as shown at *H* and by the dotted lines *K*. If the work is to index in one direction only, one nut might be sufficient, providing the direction of the indexing is such as to tend to tighten the nut

rather than to loosen it. If the indexing is likely to be in both directions two nuts are necessary.

In Fig. 96 is shown another angular jig for drilling a series of angular holes in an automobile piston. The work *A* is located on a stud *B* and drawn down against its shoulder by the pull back rod *C* which is tightened by the hand knob *D*. In tightening this rod a clamping action takes place on the pin *E* inserted in the wrist-pin hole.

As the angular-drilled holes need not be particularly accurate in their spacing, the indexing is done by means of the ball *F* which snaps into notches cut around the plug *G*. The bushing in this jig is carried in an overhanging arm *K* which forms a part of the jig body *L*. The designer should pay attention to the stability of jigs of this character and should provide a base of sufficient dimensions so that it will be well supported.

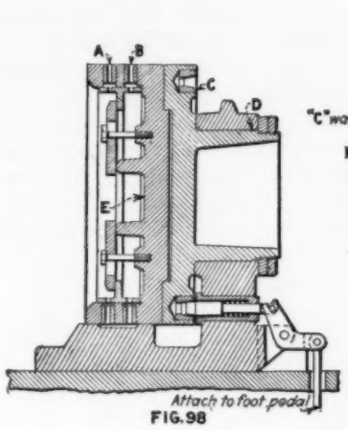


FIG. 98

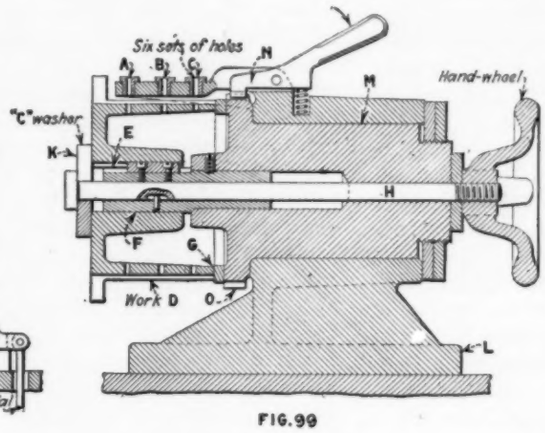


FIG. 99

FIG. 98. INDEXING JIG FOR RADIAL RIVET HOLES. FIG. 99. INDEXING JIG FOR A CLUTCH DRUM

When several holes are to be drilled in a ring such as that shown at *A* in Fig. 97, two methods can be used. If there is available a multiple drill of capacity suited to the work, a simple jig can be made so that all the holes can be drilled at one time. If, however, such a machine is not available, one solution of the problem is to use an indexing jig. The type shown in Fig. 97 is exceptionally good from the indexing point of view, because there is very little chance for dirt or chips to get into the mechanism and thus cause errors in indexing.

The work is clamped on the locating ring *B* by the sliding clamps shown at *C* and a bushing *D* is so placed that the holes will be located the correct distance from the center of the ring. Sufficient clearance must be allowed between the work and the bottom of the bushing at the point *E* so that there will be no difficulty in the removal of the work. The indexing mechanism consists of a circular plate *F*, in the underside of which are located the bushings *G*. The index plate is centered in the base *H* and is held in place by the two locknuts *K* and *L*.

The index plunger *M* is operated by means of the lever *N* which projects out through the side of the fixture in a location convenient for the operator. The work can be indexed either by pulling it around, by grasping the ring or by means of holes in the index ring *F*. This type of jig is excellent for many purposes and the principles shown can be applied not only to drill jigs but to other indexing fixtures for various machining operations. It should be borne in mind that the class of work for which an index fixture is designed and the amount of pressure which it is called upon to withstand will affect to a large extent the general design and proportions of the fixture.

Fig. 98 shows a large jig designed for use in drilling a series of holes *A* and *B* equally spaced around the periphery of an automobile brake band. This jig is quite different in construction from any of those shown previously and it may be considered in the nature of a "horrible example." In other words it is something which is neither practical nor well designed, yet it is expensive and much unnecessary work is involved in its construction. The entire construction is very clumsy and heavy. A very large bearing is given to the index plate *C*. The index plate and the casting *E* which carries the bushing, have been made separate, for no apparent reason except the possibility of breakage while machining the casting or on account of replacement in the event of serious wear in the index plate. In addition to these points a series of bushings *A* and *B* have been located around the periphery of the jig when two bushings that would have answered all purposes could easily have been carried on the stationary member. The only really good feature about the fixture is the indexing mechanism which is designed so that it can be operated by a foot pedal.

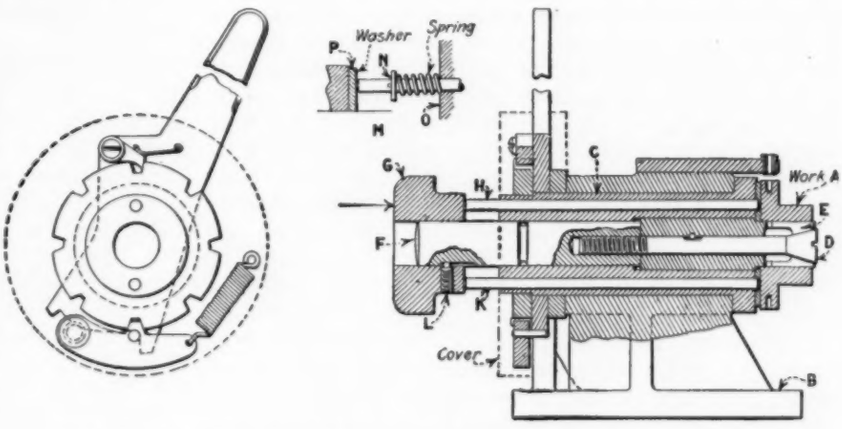


FIG. 100. RAPID PRODUCTION INDEXING JIG FOR A SMALL HUB

It is suggested to the student of these articles that he make an alternative design of an indexing jig for the same piece of work, employing some of the principles which have been illustrated. The brake drum diameter was 14 in. and the face 3 in.

A decided improvement on the jig shown in Fig. 98 is that illustrated in Fig. 99. A series of six slots containing three holes each, *A*, *B* and *C*, are spaced equally around the periphery of the work *D*. Previous to the drilling operation the work has been bored, turned and faced and a keyway has been cut at *E*. It is necessary to locate the various holes in relation

to the keyway mentioned, so the jig is made with a locater to provide for this. The work is slipped over the locating plug *F* and is drawn back against the hardened locating plate *G* by means of the rod *H* operated by the handwheel.

Rapid removal is assisted by means of the C-washer *K*. The base *L* is of substantial construction and has a bearing of large diameter in which the locating member *M* revolves. The correct location of the various holes is obtained by means of the index lever *N* which engages in a series of notches *O* in the outside diameter of the plate. The construction of the lever is somewhat similar to one of those shown in Fig. 91.

In general construction this jig embodies some good features in design and should be studied carefully. Some of the advantages are that it can be cheaply made, and can be easily adjusted for wear by simply "papering up" under the locating ring *G* and making suitable adjustments on the bearing *M*.

High Production Indexing Jig

In Fig. 100 is shown an excellent example of a high production indexing jig for a small hub *A* which has a series of eight small holes drilled radially in its outside diameter. It will be noted that the indexing mechanism is similar to the one illustrated in the earlier part of the article. The base of the fixture *B* carries a spindle *C* which is provided with a taper plug *D* so designed that it will expand the split end of the arbor *E* on which the work locates. The plug is actuated by the rotation of the threaded plug *F* which is operated by means of the hand knob *G*.

Due to the fact that the work is of a nature making removal from the arbor difficult, the two ejectors *H* and *K* are provided. When the operator loosens the taper plug by means of the knob *G* a slight blow of the hand on the knob in the direction indicated by the arrow will force the work from the arbor. A sliding member is provided for the knob which permits it to act after the screw is tightened to the taper plug. This is done by means of a setscrew *L* which engages with a longitudinal slot in the outside of the plug. An additional refinement can be made on the ejector by using the construction shown at *M*. A coil spring is interposed between the collar *N* and the face *O* so that it tends to pull the plungers back after they have been operated. A hardened washer also can be fastened against the face of the knob *G* as indicated at *P*. For small work produced in large quantities variations of this design will be found to give excellent results.

Notes on the Machine Industry in India

By C. F. Meyer
Landis Machine Co., Waynesboro, Pa.

The future for India has great possibilities, but at the present moment it would be erroneous to look upon India as a manufacturing country. There is no mass production and for the present it must be considered as a big repair shop.

Calcutta is the industrial center of India. Jute mills numbering between fifty and sixty, line both banks of the Hooghly, the principal mouth at the delta of the Ganges. Each has a well-equipped repair shop for plant maintenance, and one or two have in addition larger machine shops for building their combing and weaving machinery. Bombay ranks second in industrial importance, having in its vicinity some very fine railway shops and ship yards.

The Tata Iron and Steel Company, Jawshedpur, is one of the finest and best equipped plants in the whole of India. This company was founded by H. N. Tata, a wealthy Parsee, but is now managed by American and British engineers. Another plant worthy of mention is that of the Bengal Bridge & Bolts, Ltd., located just outside Calcutta. This concern is managed by J. C. Banneejee. Most of the railway shops are also equipped with modern machine tools.

European Executives

All of the railway shops and most private companies employ European managers, engineers and foremen. These are the men who have made industrial India what it is today and much credit is due them. Native labor, like the man from Missouri, must be shown. It is out of the question to give the average native a blueprint or drawing of a machine part and expect him to produce the finished article. Take for example a turret lathe job. The foreman sets up the machine and makes several pieces while the operator looks on. The operator observes that a movement of the turret handle toward the headstock will advance the tool then in position, that the next tool is brought into position by a reverse movement of the turret handle and that the die head, if there be one, is closed by a pull of the lever provided for the purpose. He is now ready to proceed; but as regards the theory of the operations he knows nothing and cares less.

The majority of the people of India are Hindus divided into numerous castes. Each cast can perform only certain duties and no Hindu will undertake a task foreign to his particular caste. Members of certain castes will not handle leather belting because the cow is sacred to them. Others will not permit the use of certain lubricating oils. If an operator is killed by a machine, no one except a member of the lowest caste will touch his body.

One finds much of interest on entering a machine shop in India. To the right you see a native perched on the table of a large planer riding backward and forward. His clothing consists of a turban wrapped around his head and a piece of colored cloth girded about his waist. On the left you see another workman squatting on the bed of a lathe. The women are the beasts of burden. They carry the work to and from the machines. They wear a sari draped gracefully over their heads and wrapped about their bodies. Neither the men or the women wear shoes and it is a remarkable sight to watch them at work in a foundry. They carry the moulten metal from the cupola to the moulds and step among the red hot iron castings without injury.

Native labor is plentiful, but not cheap. The wage of the so called mechanic is very low when compared with the American standard, but this is offset by his superstitious and lazy nature. The average native is afraid of a machine tool and it is almost impossible to find one who will operate a machine at any other than its slowest speed. Multiple spindle machines are absolutely useless, unless an operator is employed for each spindle. As for the automatic machine, the native mechanic looks upon it as a thing possessed with an evil spirit and will not go near it.

Labor in India is not organized, but this does not prevent it from interfering with industry by indulging in periodic strikes.

Manufacturing Applications of Ingersoll Drum-Type Milling Machines

Continuous Milling on Work of Medium Size — Three Types of Job Performed — Specia Fixtures for Holding Work — Automatic Clamping Devices on Some Fixtures

By J. V. HUNTER

THE continuous milling machine of the so-called drum type mounts the work on a continuously revolving drum and carries it between sets of cutters that finish one or more faces, according to require-

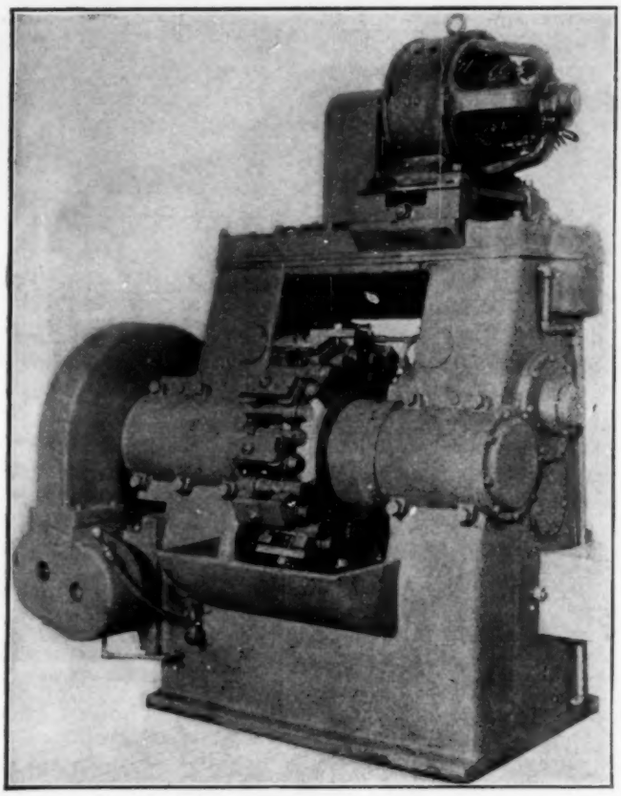


FIG. 1. LOADING SIDE OF 30-IN. DRUM-TYPE MILLING MACHINE

ments, so that the operation has been completed and the work is ready for removal when it again returns to the loading station. Many other classes of work can be handled on these machines, including slitting and cutting-off operations. In order to handle parts of medium size, the Ingersoll Milling Machine Co., Rockford, Ill., has developed several types of these machines, which in the main resemble the large drum-type milling machine that was described in the *American Machinist* on page 645, Vol. 51. However, the new machines are smaller, more compact units and are rated by the builder according to the diameter of the wormgear that drives the drum.

Construction of the Machine

The small machine, Fig. 1, designated as the 30-in. size, has a base and frame made of a single box-form casting inclosing all the operating gears and mechanism. The latter is designed in units and placed in compartments insuring the exclusion of dirt by cover-plates, which may be seen in the front view of the machine, Fig. 2. The drive motor is mounted on the top of the frame and its power is carried by a chain drive to the main jackshaft inclosed in the upper section of the frame. From the jackshaft the power is transmitted to a vertical shaft in each side housing; and that in the right-hand frame housing, in turn, distributes it to the drum-feed gear box and to the gearbox for the spindles on that side of the frame.

The machines are each intended for a single purpose, and it has, therefore, been unnecessary to provide an elaborate system of gearing for changing the speeds and feeds; but they may be altered when necessary by removing the gearbox coverplates and changing pick-off gears. The rate of feed of the work is regulated by the speed of revolution of the work-carrying drum, which is driven by a worm and wormgear located in the large projection of the housing at the right-hand side of the main frame.

The cutter spindles are located in the frame on both sides of the drum and toward the front of the machine, leaving the rear free to serve as a loading station. One or more cutter spindles can be provided as the nature of the work demands.

Almost as much of the success of manufacturing ma-

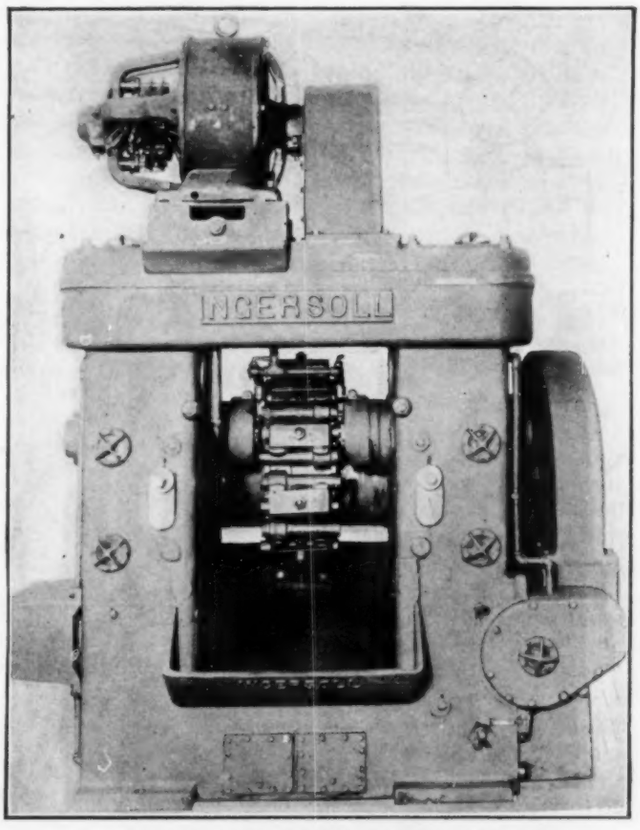
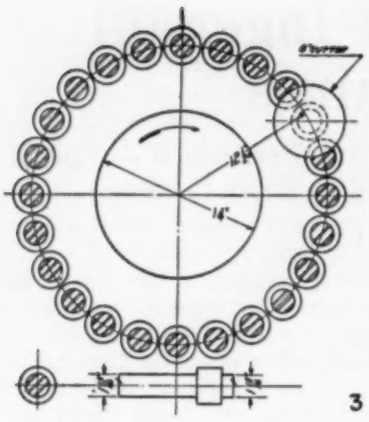
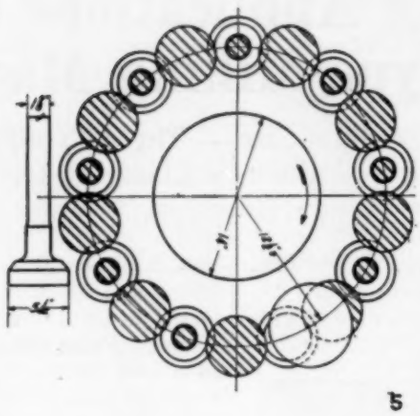
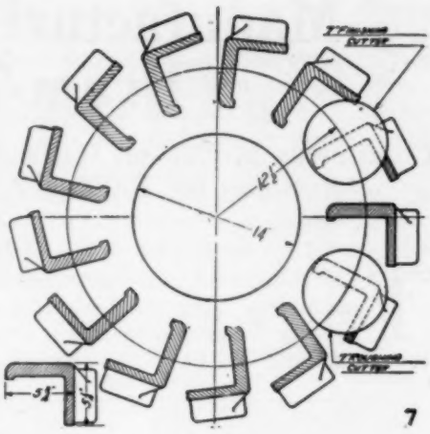
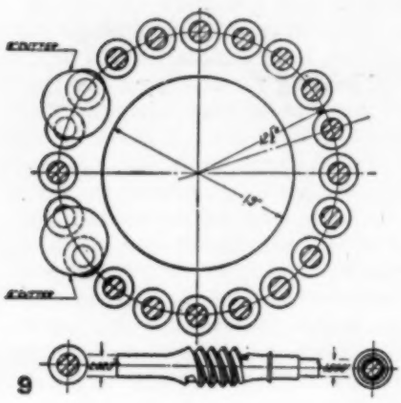


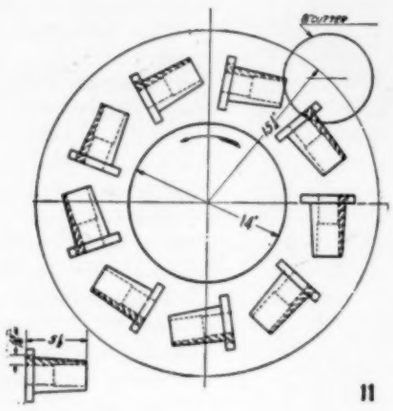
FIG. 2. FRONT OF MILLING MACHINE SHOWING CUTTER SPINDLES

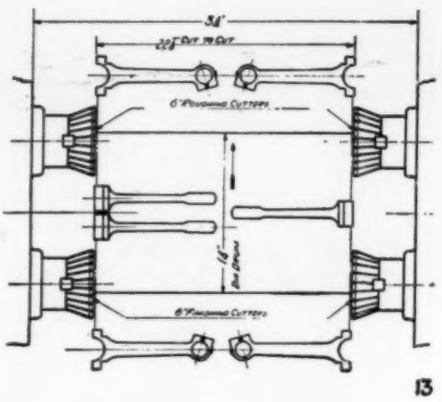


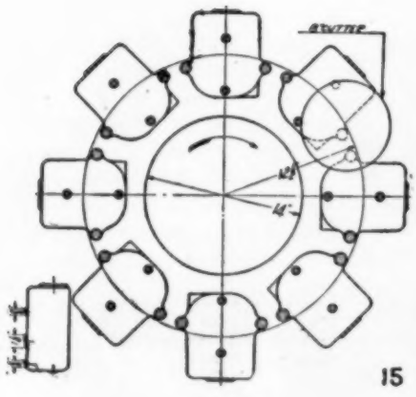












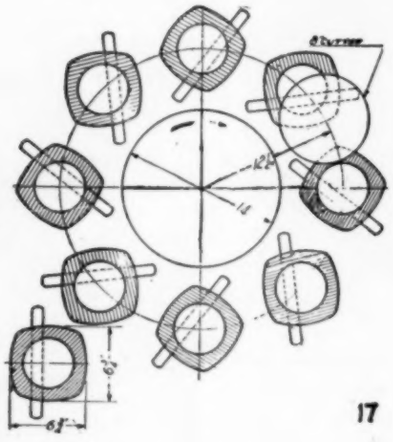
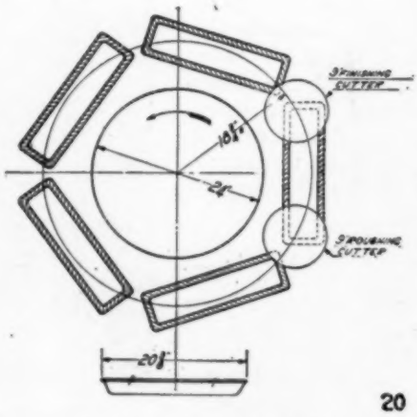


FIG. 3. LOADING DIAGRAM OF DRUM FIXTURES FOR MILLING SHAFT TO LENGTH. FIG. 5. WORK-LOADING DIAGRAM ON TRANSMISSION-SHAFT MILLING JOB. FIG. 7. POSITION OF CASTINGS ON DRUM. FIG. 9. DETAILS OF WORMSHAFT MILLING JOB. FIG. 11. BUSHING AND WORK DIAGRAM FOR SLOTTING OPERATION. FIG. 13. POSITION OF CONNECTING RODS FOR MILLING OPERATION. FIG. 15. SURFACES FINISHED ON CASTING. FIG. 17. DIAGRAM OF DRUM LOADING FOR DRAW-BAR MILLING OPERATION

chines of this type is due to the design of the work-holding fixtures as lies in the character of the machine itself. Therefore, each machine is largely a special job, and its manufacturing application must be studied and its work-holding fixtures designed at the time the machine is laid out. The operations to be performed on the work naturally have a controlling influence on the design of the machine; and lead to three different methods of arranging the work on the holding fixtures.

In one case, when parts can be milled on two ends or sides simultaneously, they are so mounted that this



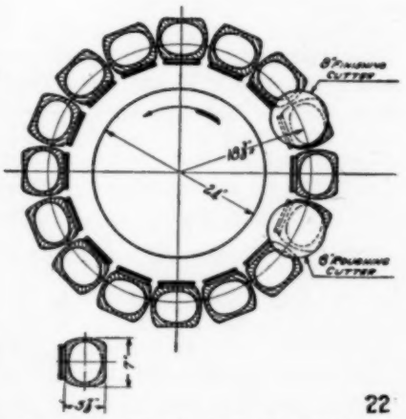


FIG. 20. FLANGES FACED ON MACHINE SHOWN IN FIG. 19. FIG. 22. DIAGRAM ON SECOND SETTING FOR DOUBLE MILLING JOB

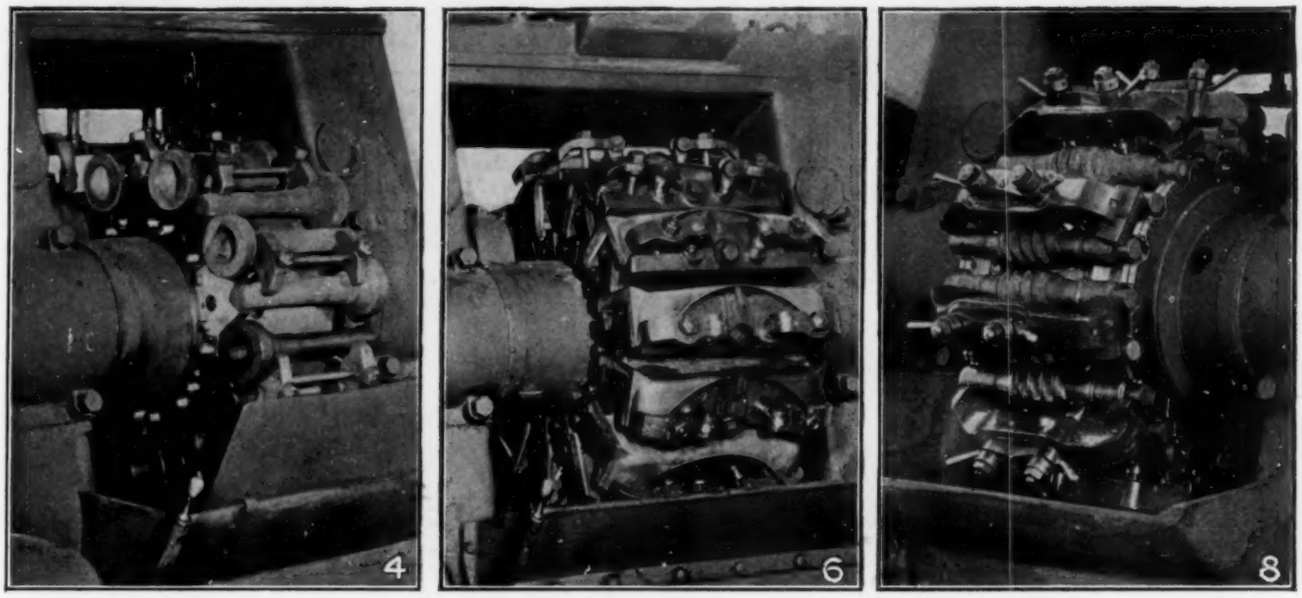


FIG. 4. DRUM FIXTURES FOR MILLING TRANSMISSION SHAFT. FIG. 6. LIGHT CASTING HELD FOR MILLING. FIG. 8. DRUM FITTED WITH AUTOMATIC CLAMPING DEVICE

may be accomplished as shown in the transmission-shaft operation in the two illustrations already considered. Secondly, parts that are milled on only one face are mounted in pairs, or staggered so that the spindles on both sides of the housing are both engaged in finishing parts. A third class includes parts with surfaces to be finished lying at an angle to one another; and they may be machined by first milling one face while held in fixtures on one end of the drum and then shifted to fixtures on the opposite end for finishing the remaining face.

Milling Shaft Forgings to Length

The machine shown in Figs. 1 and 2 was built for milling a shaft forging to length; and the diagram shown in Fig. 3 shows the size of this forging and the position of the successive forgings when mounted on the drum fixtures. The diameter of the drum shaft is 14 in., and on it are mounted fixtures for holding 24 pieces placed so that their centers are at a radius of 12½ in. from the shaft center. Only three pieces of work can be in contact with the cutters at any one instant. The loading station is at the rear of the machine, and the pieces are clamped on in pairs, a single bolt serving to pull them into the V-shaped notches of the fixture. The machine rating is based on a factor of 85 per cent of the possible production capacity; and at this rating the production is 72 pieces per hour. A 15-hp. motor is required for the drive.

A job involving alternate light and heavy cuts, illustrated in Fig. 4, shows the operation of milling a transmission shaft to length. The forging has a diameter on its small end of 1⅞ in., Fig. 5, and on the large end it has been upset into a cup-like form with an outside diameter of 5$\frac{31}{32}$ in. Its size permits mounting only 16 forgings on the drum at a time. However, owing to the nature of the material, the spindles and feed can be run at a higher rate, so that based on the production factor previously used it is found that this machine will produce 96 pieces per hour.

It is a decided step from the heavy, stocky forging, just described, to the light, almost fragile castings that are handled on the machine shown in Fig. 6. The design of the work-holding fixtures are a distinct factor in the success of handling this peculiarly shaped casting. The pieces stand in the fixture in the position indicated in section, Fig. 7, with a possible total of 13 pieces mounted on the drum. The parts are held by hinge-shaped clamps, secured by a single bolt at each end; and when the bolt is loosened the clamps may be swung to the side to clear the bolt and then raised to free the casting. This arrangement prevents the necessity of handling a lot of loose clamping pieces when

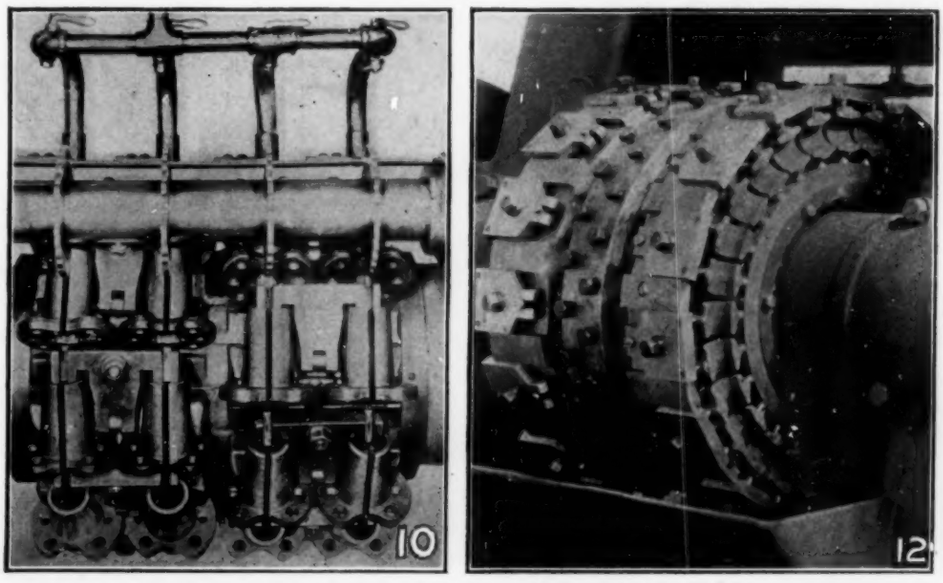
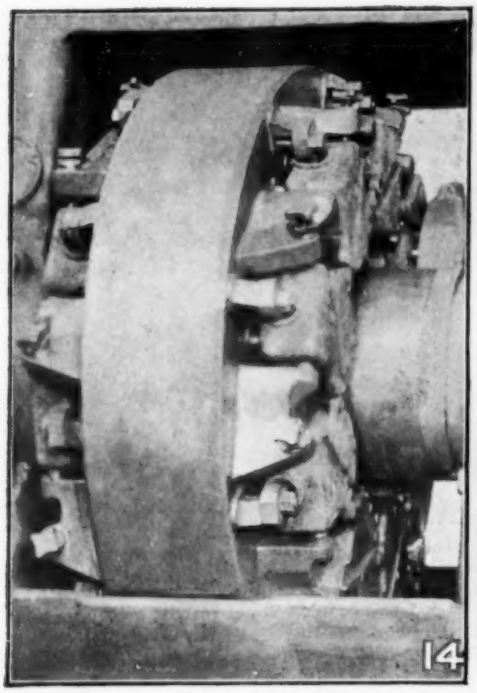


FIG. 10. MACHINE FITTED FOR A SLOTTING OPERATION. FIG. 12. DOUBLE-END DRUM FOR MILLING CONNECTING-ROD FORGINGS



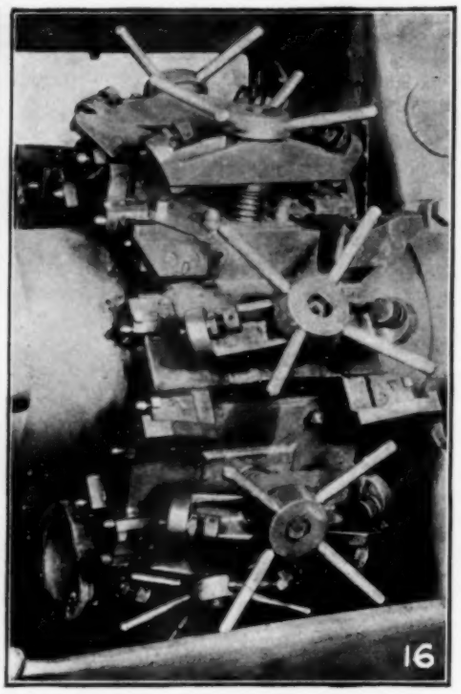
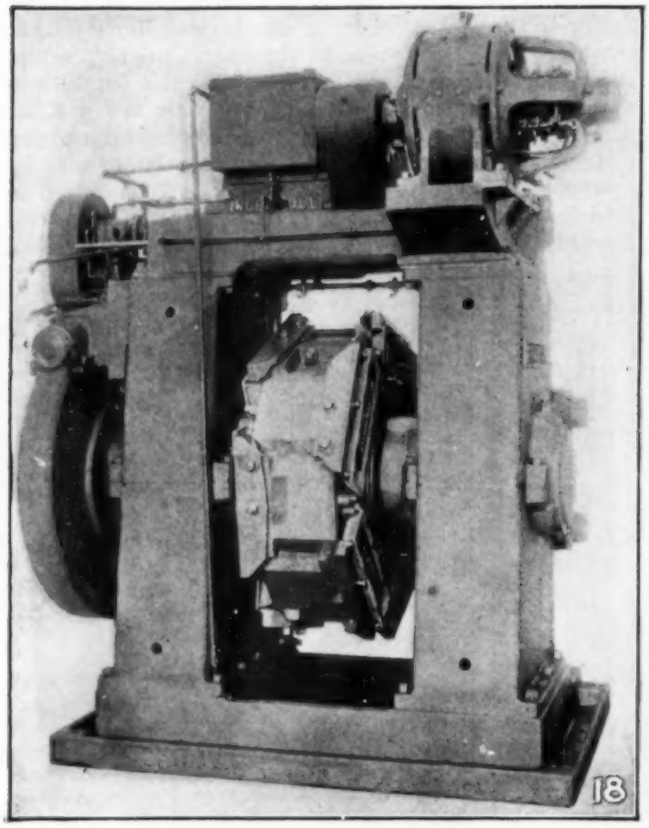


FIG. 14. CASTINGS BOLTED TO SIDES OF DRUM FOR FACING OPERATION. FIG. 16. QUICK OPERATING MECHANISM FOR CLAMPING A FACE-MILLING JOB

replacing the work. A third bolt in the center of each fixture is provided to control stops in the center and at each end of the casting that are drawn up to prevent springing under the strain of the cut.

Roughing and finishing cuts are required on this casting in order to hold it to close limits of accuracy. Therefore, two spindles are provided on each side of the machine frame, so that one cut will follow the other as the piece progresses from one spindle to the next. The drum turns toward the operator as he faces the machine at the loading station in the rear; and as the spindles are located in the front of the frame it is necessary to have the roughing cutter below and the finishing cutter above. This arrangement has a further advantage of preventing the heavy chips from the roughing cut falling on the finishing cutter. Rated on the production basis previously mentioned, this machine will finish 171 castings per hour. Adjustment of the cutter spindles is provided for by means of quills that project through the front of the housing on each side.

An automatic work-clamping fixture is used on the machine shown in Fig. 8, in a milling operation on a forged-steel worm-shaft to size it to length. The clamping action is regulated by means of a cam carried on a stationary shaft passing through the center of the hollow drum shaft and secured in the housing at one end. The pull of the holding bolts is governed by a spring tension that accommodates itself to the irregularities of the rough worm-shaft forgings.



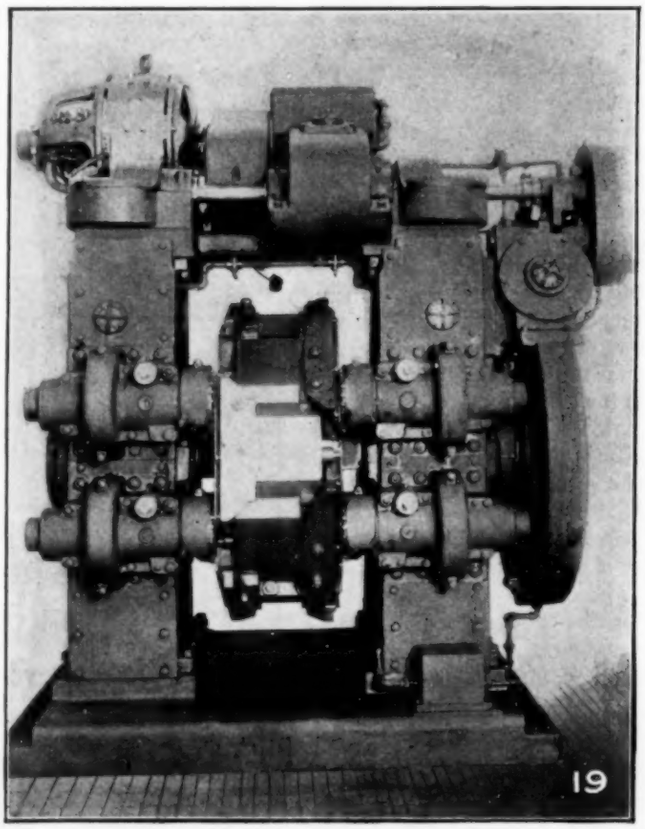


FIG. 18. LOADING SIDE OF 42-IN. DRUM-TYPE MACHINE. FIG. 19. SPINDLE SIDE OF MACHINE FITTED FOR FACING FLANGES

Just before each section of the drum reaches the loading station, the cam releases the tension on the holding bolts and the operator is then able to grip the small handles and swing the spacing bar into a vertical position about its central pivot so that it clears the bolts. The main clamping bar will then slip out far enough on the bolts to release the forgings for removal. After the work has been replaced with fresh pieces, the main bar is slid in place over the forging and the spacing bar again swung into position on the bolts, thus holding the work in the fixture until clamping pressure is applied by the cam and releases the springs as each successive section of the drum begins to pass through the top of the frame housing.

Seventy-five pieces of the work, Fig. 9, can be produced per hour. The machine is fitted with two spindles for milling each end of the work. The first serves merely to remove the surplus material from the end of the bar, since some forgings are considerably over length. The second spindle finishes the shaft to length, making a cut to the depth of $\frac{1}{16}$ in. in average specimens.

The machine shown in Fig. 10 performs a slotting operation on the bushing detailed in Fig. 11. Four rows of bushings are carried in the drum fixtures, clamped up in pairs, and the pairs are staggered so that the full load does not come on the cutter spindle at one time. Despite the length of the cut, there are so many pieces in process that an hourly output of about 155 pieces is obtained. Opposed spindles are placed in the housings and carry a cutter arbor extending from one spindle to the other and parallel to the drum axis. The arbor carries four slotting cutters.

Milling Ends of Connecting Rods

An operation of the second classification, milling work on one end only, is done on the machine, Fig. 12, that is used for milling the ends of connecting-rod forgings. The machine has been designed with a drum of sufficient length so that the rods may be placed end to end, as indicated in Fig. 13, with their crank ends facing the spindles in opposite housings. The pieces have been staggered on the drum so that the opposed spindles are not taking up new cuts at the same instant. Six-inch diameter cutters are used for both the roughing and finishing cuts. The forgings are so closely spaced in the fixtures that 56 pieces are held at one time, and an hourly production rate of 376 pieces results.

For milling the faces of castings the parts are frequently mounted on fixtures on the sides of the drum, as shown in Fig. 14. In this operation the casting, detailed in Fig. 15, is faced off on four bosses. The fixtures are staggered for the reasons previously given and the drum will hold a total of 16 castings. The feed of the drum is arranged to give an hourly production of 110 pieces.

A heavy cast-steel drawbar cap is faced off in the machine shown in Fig. 16. Sixteen castings held on opposite sides of the drum fixtures complete a load and result in an hourly production of 96 pieces when the machine is rated at a production factor of 85 per cent. The position of the drawbar caps on the drum is detailed in Fig. 17. It will be noted that in this case the castings have not been staggered, but are so placed that a single-spoke wheel for each section of the fixtures operates a clamping bar to force the castings against hardened-steel stop plugs provided for correctly locating the castings.

A larger machine is used when the area of the work is too great to permit mounting it on the drums of the 30-in. machine. The larger machine has a worm drive wheel of 42-in. diameter; but its other general characteristics, as shown in Fig. 18, are similar to the machine already described. The most noticeable change is in the housings, which, owing to the greater size of the castings, are built in sections and bolted together. The drum shaft is inclosed in bearings in the housing, and the position of the spindles, Fig. 19, has been changed so that they are held in bearings bolted to the side of the frame. On this machine the thin shell, shown in Fig. 20, is finished on its bottom flange at the rate of 71 pieces per hour.

Milling Non-Parallel Surfaces

The third class of milling operations previously mentioned relates to work on a part with two or more surfaces so located that it is necessary to remove the

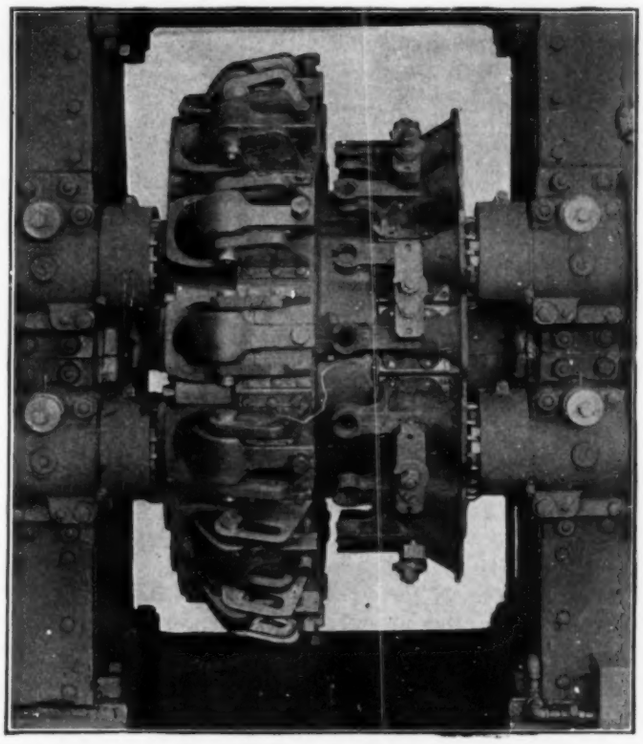


FIG. 21. MILLING RIGHT ANGLE FACES ON A SINGLE MACHINE

piece from its holding fixture after the first milling cut and place it in a second fixture for completing by another pass through the machine.

This sequence of operations is performed on the tank top machined on the 42-in. machine and illustrated in Fig. 21. For the first cut, the castings are held in fixtures on the larger, left-hand end of the drum in a radial position with their small ends toward the center of the drum Blocks that fit into the hollow openings of the castings clamp them against the locating points on the sides of the fixture.

For the second cut, Fig. 22, the pieces are located from the surfaces already milled, and mounted in fixtures on the other end of the drum. Each set of fixtures holds 16 castings and they are transferred from the set of fixtures used for the first cut to the second as each casting returns to the loading station. At the same time, a fresh casting is inserted in the fixture of the first operation so that both sides are constantly carrying a full load.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Machining Side Cams on a Gear Cutter

BY ETHAN VIALL

In the shop of Wappat Bros., Pittsburgh, Pa., side cams are machined on a gear cutter as shown in Fig. 1. The milling cutter is set as shown at *A*. The cam to be

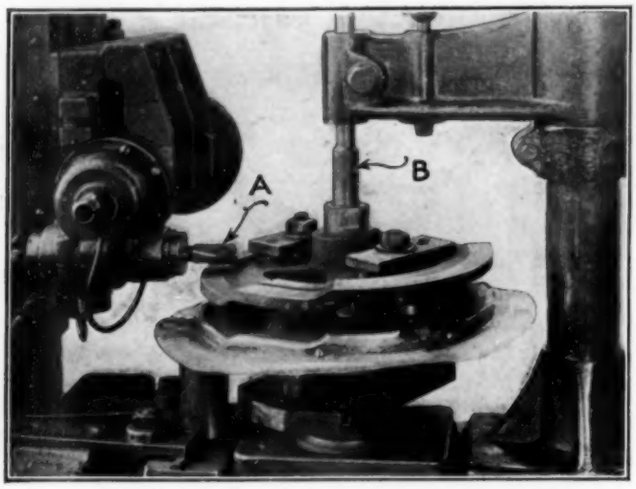


FIG. 1. GEAR CUTTER ARRANGED FOR MILLING SIDE CAMS

machined is mounted on an arbor *B* which passes through the work spindle of the machine, and is free to slide vertically. The master cam is keyed onto this arbor, just below the work, and rests on a fixed roller. Two pins in the lower side of the master cam run through holes in the faceplate of the machine, and drive the arbor.

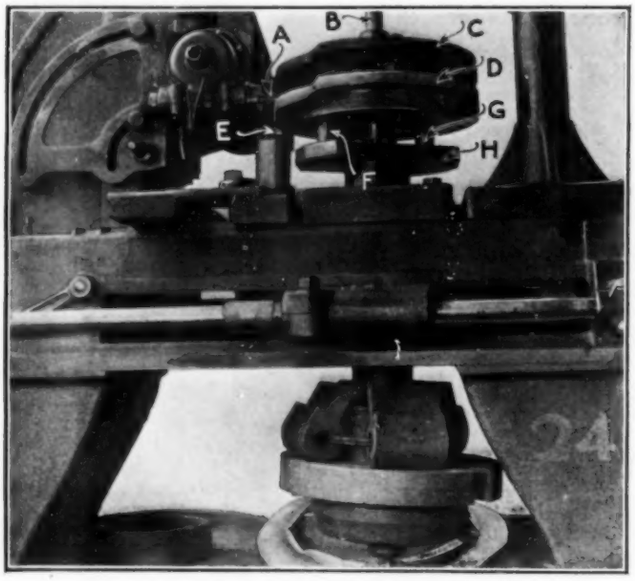


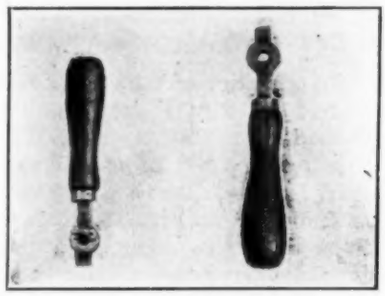
FIG. 2. AN UNDERNEATH VIEW OF CAM-CUTTING MECHANISM

A better understanding of the method will be obtained by studying Fig. 2. In this illustration, *C* is the cam to be cut; *D* is the master cam; *E* is the fixed roller, over which the master cam rides; *F* and *G* are the two pins set into the lower side of the master cam, and which go through the holes in faceplate *H*; *I* and *J* are weights used to keep the master cam in contact with the fixed roller; *K* is a tin chip guard, which has been removed, but is shown in place in Fig. 1. In this view also the milling cutter *A* is shown set to mill the under side of the cam, while in Fig. 1 it is set for milling the upper surface. The work spindle is, of course, geared to revolve continuously, and not merely index, as in gear cutting.

A Screwdriver of Merit

BY MILTON WRIGHT

The cut shows a screwdriver that has been in service on the assembling job in a factory building a line of heavy machinery, for a good many years. It is always on the job for the reason that it can't get lost. When you want to "sock-up" a screw you put a piece of drill rod through the hole and this gives you a leverage that will easily break any screw with which it can be used. (You must use judgment with the drill rod; the tool is not foolproof.) When you are through with it, don't throw it under the bench, hang it up on a nail; that's what the hole is for.



THE SCREWDRIVER "WITH A HOLE"

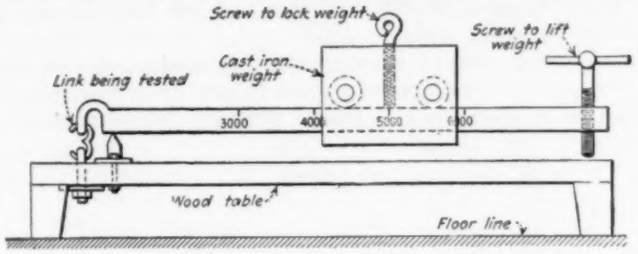
Inexpensive Pull-Test Equipment

BY H. WYMAN

The writer has the supervision of the heat-treatment of small forged pieces in the form of a figure "3" that are subjected to a pulling strain when used. It was desired to make frequent tests of the pulling strength of these pieces as they came from the rotary hardener performing the last heat-treatment. A regular power-driven, accurate, laboratory type of machine was available but it was located in a building nearly a mile away from the work, so the device shown in the accompanying cut was made to take care of these routine tests.

The balance bar was made from a piece of industrial railway track. One end was forged out into an eye into which the figure "3" hook would enter, and the other end tapped for the screw which enables one man to manipulate the casting or weight easily. As close to the eye end as possible a notch was made and the fulcrum

was formed by resting the bar, or beam, on a knife-edge piece of ordinary machinery steel bolted to a platform. Directly under the eye an eyebolt was fastened through which the other end of the test piece was hooked. A



SIMPLE PULL-TESTING MACHINE

casting weighing about 500 lb. was the only real item of expense, and this (equipped with rollers to facilitate handling) was mounted on the balance bar with a large setscrew through its center, bearing on the bar to hold it in place while making the test.

The application of the test is as follows: The bar and weight are raised by means of the elevating screw; the test piece is hooked in and the slack taken up by the nuts on the eyebolt. The weight is set at the desired point and fastened by means of the setscrew. The test is then applied by lowering the weight by means of the elevating screw. If the piece supports the weight at this point the pull can be increased by rolling the weight farther along the bar, and when the piece finally breaks the amount of pull is read from the graduations marked along the side of the balance bar.

Naturally, the results secured by this machine are not absolutely accurate to the fraction of a pound, but in this case its constant use gave a more uniform and greatly improved product.

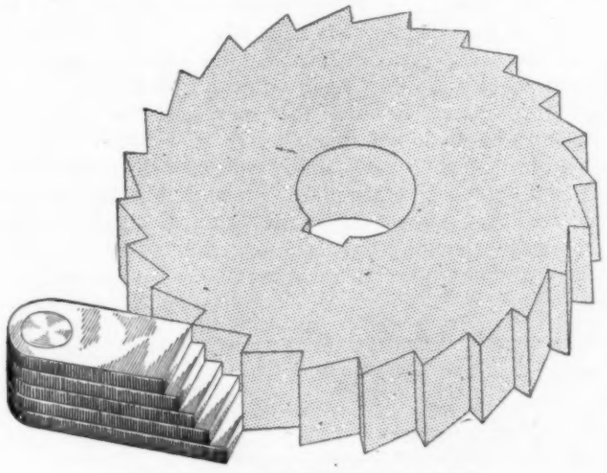
Ratchet With Multiple Pawls

BY JOHN S. WATTS

Cases frequently arise where it is desirable to have a finer adjustment of a rachet wheel than can be made by the ordinary method without making the teeth so fine that they will not carry the load. The accompanying sketch shows a simple and ingenious way of getting over this difficulty, and consists mainly in making the pawl in sections or laminations as shown.

The ratchet wheel shown has twenty-four teeth, and is 9 in. in diameter, which with a solid pawl, would allow a travel of 1½ in. between the teeth. If the pawl is made in five sections as shown this travel will be reduced to one-fifth of this amount or under ¼ in.

There is practically no limit to the fineness of adjustment that can be had by this arrangement, as a smaller movement simply means more pawls, which can be accommodated by making the face of the rachet wheel wider, so that each pawl will be capable of carrying the load.



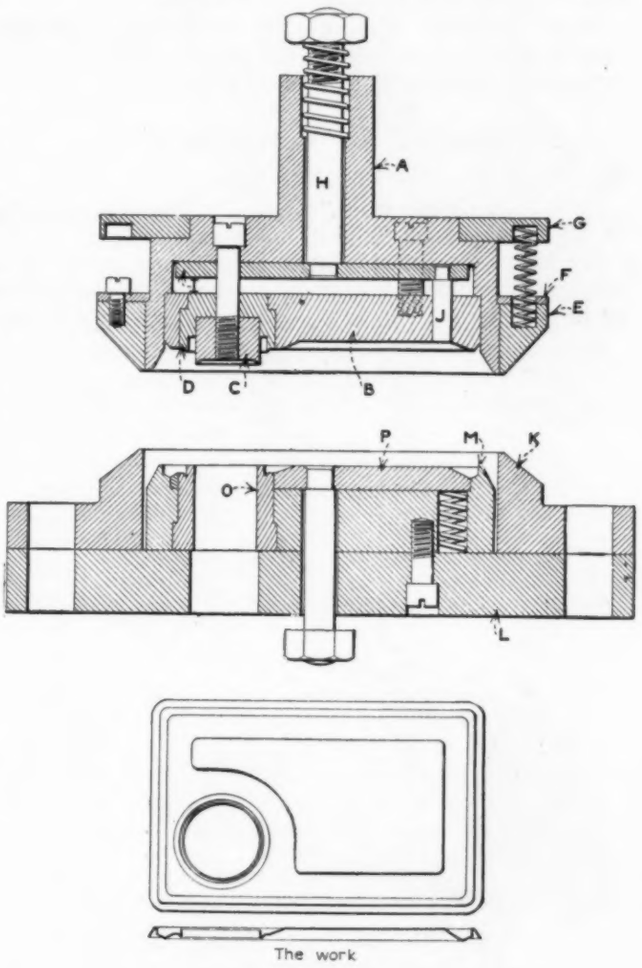
RATCHET WITH MULTIPLE PAWLS

Blanking, Drawing and Piercing a Varnish Can Top in One Operation

BY S. A. MCDONALD

The die for blanking, piercing the opening, and forming the flange in one operation on a ½-gal. varnish can top is shown in the illustration herewith.

The blanking punch *A* is made with a machine steel



THE PRESS TOOLS AND THE WORK

shank welded to a tool steel cutting edge. The punch center *B* is secured to the punch by three screws, and contains the piercing punch *C* and the hole flange forming bushing *D*. The bronze stripper ring *E* is secured to the punch by two plates *F* which are secured to the stripper by screws. The downward motion of the stripper is stopped by these plates coming in contact with a shoulder on the punch. The spring backing plate *G* is secured to the body of the punch. To the knockout stem *H* is riveted a plate *I* containing four knockout pins *J*.

The blanking die *K* is made of a machine steel plate

with a tool steel cutting edge welded to it, the shoe *L* is fastened to the blanking die by screws and dowel pins. The die center *M* is also secured to the shoe in a like manner, and it contains the hole flanging die *O* and the spring actuated die pad *P*.

When the punch descends it blanks out a round cornered blank, and carries it down with the spring pad until the hole piercing punch *C* cuts the hole. As the punch continues to descend it draws the tin over the die *O*. At the same time the outer flange is formed over the die center *M*.

On account of the small flange no drawing ring is necessary, and the corners form smoothly by bumping the punch and die centers together. The groove formed around the hole flange is to retain solder when a nozzle is soldered on in a later position. The spring pad *P* ejects the tin on the return stroke and brings the pad flush with the cutting edge.

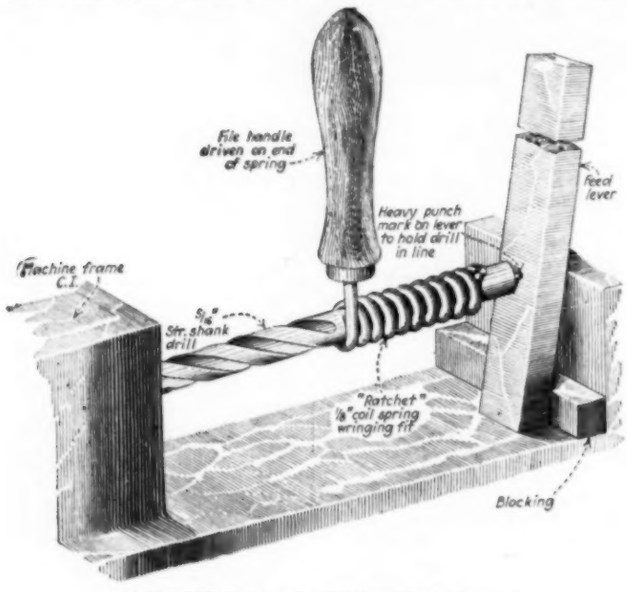
When the punch nears the end of its stroke the four pins *J* eject the tin from the punch. The press is inclined so that the tin falls clear of the die.

A "Ratchet" for Restricted Spaces

BY GEORGE SIEGRIST

Here is a simple drill "ratchet." The idea may be as old as most such "kinks" but it is new to me.

We had some ⅜-in. tap holes to drill in a recess on a machine frame and, having no ratchet short enough to go in the space, I rigged up the one shown by winding


File handle driven on end of spring
Heavy punch mark on lever to hold drill in line
Feed lever
Machine frame C.I.
⅜" Str. shank drill
"Ratchet" ⅛" coil spring wringing fit
Blocking

A QUICKLY MADE "RATCHET" DRILL

a spring of ⅛-in. tool-steel wire tightly around a ¾-in. rod for about 10 turns. This left the opening in the coil smaller than was wanted so it was reamed out with a 0.309-in. drill leaving the opening with a "flat" bearing inside and allowing the coil to be swung on the shank of a new ⅜-in. drill. The "feed" was by means of a lever with a punch mark in it to hold the end of the drill. This lever to be backed up by using increasingly thicker packing as the drill went in.

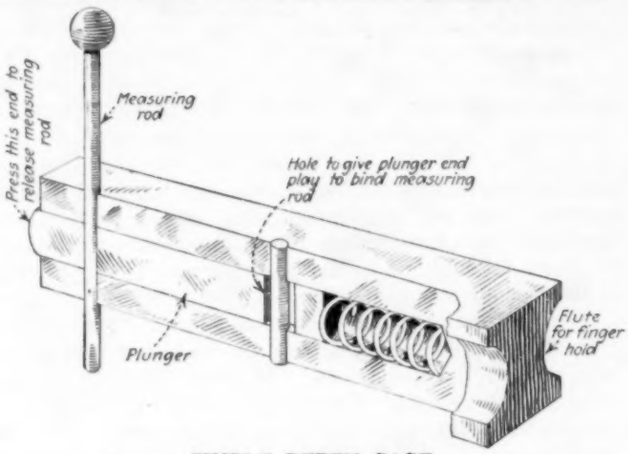
The ratchet and lever end of the drill were oiled and put to work. The ratchet never failed to drive the drill under pressure, or to release every time on the back stroke. With a rig of this kind it is possible to drill very close to the bottom of a recess, or in a narrow slot, the depth depending upon the length of the drill.

A "One-Hand" Depth Gage

BY RICHARD H. KIDDLE

The sketch herewith shows a depth gage that is very handy because of the fact that but one hand is necessary to manipulate it.

Take a piece of square stock of convenient size and mill flutes along opposite sides to provide a finger hold. Drill in from one end nearly through the piece length-


Press this end to release measuring rod
Measuring rod
Hole to give plunger end play to bind measuring rod
Plunger
Flute for finger hold

SIMPLE DEPTH GAGE

wise and put a rod in the hole that will slip nicely without too much shake. The rod should have a nicely rounded outer end and should bear at the inner end upon a compression spring. With the spring under compression and the round end of the movable rod just projecting from the base part, drill a transverse hole through both parts of a size that will just allow the measuring rod to slip through.

The friction imposed upon the measuring rod by the action of the spring will hold the measuring rod in any position with a reasonable degree of firmness though allowing it to be moved in either direction by a slight pressure upon the end.

Another Type of Trepanning Tool

BY E. A. DIXIE

Mr. Hunter's interesting article on page 549 of the *American Machinist* reminds me of a difficult trepanning job of many years ago, which was brought to a successful conclusion only after we had developed a new trepanning tool and a novel manner of using it.

Among other things, the job in question demanded that the ends of a large number of brass cylinders should be recessed as shown in Fig. 1. The dimensions given are only approximate, as the job was done over thirty years ago and I have only my memory to rely on for the figures. When this part of the work was reached the foreman and shop boss pleaded with the inventor that the rolls should be made in two pieces and pressed together to simplify the work but the inventor insisted they should be made from a single casting.

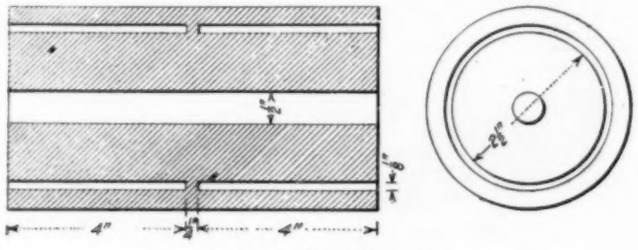


FIG. 1. THE WORK

Owing to the narrowness and depth of the slot we appreciated at the start that some sort of a trepanning tool would be required to finish it. The first trepanning tool had four lips but gave much trouble by choking with chips. We accidentally broke out one of the lips and got so much better results that we made a new one with three lips equally spaced. However, before we got very deep with this it also choked and the operator spent more time removing the tool and blowing the chips out with a mouth blow pipe than he did in making them. We then went back to the first tool but removed another of its teeth, thus leaving only two. On going deeper into the hole the same trouble developed as before; the chips choked up and had to be removed, also the operator had to be very careful not to overfeed the tool. Having gone thus far we had learned a number of things *viz.:* The fewer the teeth, the greater the chip space available; overfeeding was a cause of broken tools and spoiled work; choking with chips retarded the work even when it was not accompanied by tool breakage.

The ideal tool therefore was one with as few teeth as possible, so made that it could not be overfed, and provided with some means for evacuating the chips from the slot as soon as they were made.

Obviously, a single tooth was as few as could be

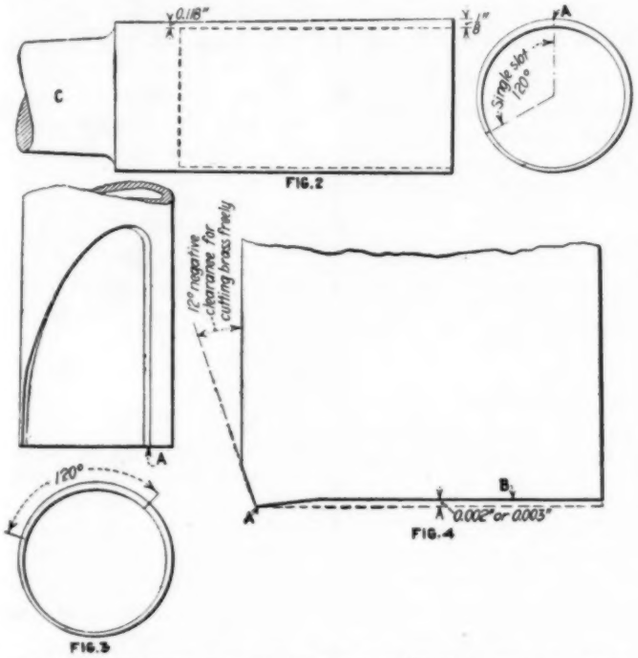


FIG. 2. THE TOOL IN COURSE OF MAKING. FIG. 3. THE FINISHED TOOL. FIG. 4. PROJECTION OF FACE OF TOOL

used. With this as a start a piece of tool steel was bored eccentrically, as shown in Fig. 2. The outside was turned concentric with the tapered shank *C* which fitted the tail spindle of the lathe. A single groove was milled as shown in Fig. 3. This gave the single tooth considerable strength as it was supported by about two-thirds of the circumference of the tool. The hole was bored a few thousandths tapering, being larger at the back than at the front. The outside was also ground tapering, being smaller at the shank end. This provided clearance both inside and out when it was in the slot. The matter of overfeeding was taken care of by grinding the face of the tool as shown in Fig. 4. I have forgotten the exact amount the cutting edge *A* projected beyond the flat face *B* but it was only two or three thousandths. It was therefore impossible for the operator to force the tool to take more of a cut than the vertical distance from the cutting edge *A* to the "heel" *B*, as the flat heel *B* would come in contact with the previously finished surface of the slot and prevent further feeding. This heel also prevented automatic digging in, a pastime in which trepanning and other tools sometimes indulge without any outside encouragement.

We had solved the two first problems, but the clearing of the chips was still to be dealt with. The lathe in which the work was being done was a small one of about 14-in. swing by about 6-ft. bed. As the brass was very free cutting, the chips could have been easily blown out by an air jet but for the fact that we had no compressed air. We therefore decided to make them fall out by gravity.

Distributed about the shop were a number of 12 x 12-in. wooden pillars which supported the floor above. To one of these we bolted two pieces of 4 x 12-in. timber about 4 ft. long. The upper one was about 6 ft. from the floor and the other just at the floor level. The lathe was then turned on end with the headstock uppermost and the feet lag-screwed to the timbers. The drive for the lathe was obtained by securing a pulley to the top of the spindle of a drill press where it projected beyond the upper bearing. This afforded a horizontal drive. With the aid of a rope, pulley and weight, the lathe carriage was counterbalanced and the carriage clamping screw was tightened enough to give sufficient friction to hold the carriage where it was put. Except for being a little clumsy to handle during the chucking operation the rig worked all right. The chips from the trepanning tool dropped out of the slot as soon as they were made and the job was finished in good time. It may be mentioned that the single toothed tool stood up for the whole of the rest of the job without breaking.

Calculating the Size of a Gage Plug by Triangulation

BY A. D. HALLET

A short time ago a problem arose in regard to checking rectangular broached holes. Common practice has been to make a plug gage, with tolerance, the size of the hole, or check with four round plugs.

The inspection department desired a rectangular plug to determine whether or not the holes in the work were diamond shaped. They specified that the thickness

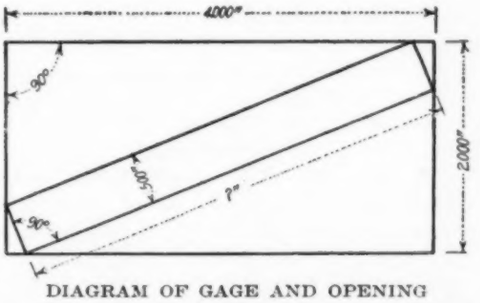


DIAGRAM OF GAGE AND OPENING

should be 0.500 in. as shown; the size of the hole being 2.000 in. x 4.000 in. The distance in question was determined and the gage proved satisfactory as long as the corners held up.

Will some of the readers of the *American Machinist* kindly submit the solution; using as short a method as possible.

IN THIS ISSUE

AFTER we have been kicked by a mule and get our eyes open again, it's a little satisfaction to figure out just why he kicked and why we landed so hard. It doesn't ease up any on the aches and sore spots but it may help us keep out of range next time. We've all been kicked good and proper by the business slump and so we asked Theodore H. Price, well-known in financial circles, to tell you how it happened and why. His "Hard Times—Their Cause and Cure" is a carefully written study of the situation and ought to help us all. It isn't a lot of platitudes or Pollyanna mottoes, but a heart-to-heart talk on the whys and wherefores of it all. This is the leading article of the issue as it should be.

In his twelfth article on "Metal Cutting Tools," De Leeuw, on page 4, takes up form tools, plate, bar and circular form tools showing the advantages and disadvantages of each. He also takes up shaving tools and shows how they act when in use. Few men have had De Leeuw's opportunities for experience and observation along this line, and nearly every one can study these articles to advantage.

Another post-mortem on business depression begins on page 9 where H. H. Manchester, who has been telling us the aftermath of other wars, gives us some interesting details of the present post-war crisis. He doesn't bore you with statistics but uses enough to show why and how things are as they are. While including all countries, he pays particular attention to the U. S. A. and takes up wages and expectations for the near future.

It is pretty well agreed that a systematic effort must be made to secure more and better trained mechanics. And while the old apprenticeship will probably never come back in its entirety, we seem destined to use a substitute which has the good features of the old, modified to suit our new conditions. The Southern Pacific Railway has been studying and experimenting along this line for years, and on page 12 Frank A. Stanley tells us of the work at the shops in Sacramento, Cal. It is not only an interesting story but it gives specific data as to subjects, hours and the results obtained at seventeen places besides Sacramento. It is good data for any shop large enough to have apprentices to study with considerable care.

Coming Features

Another far-west story is due for next week — this time from Alameda, Cal., and in it Frank Stanley shows how big Diesel engines are being built on the Pacific Coast.

Jumping about three thousand miles east there's an article from the Flather shop in Nashua, N. H., which shows how lathe parts are made interchangeable in a thoroughly practical way.

Another article on the "Design of Springs" takes up flat springs of various types. Like the other articles by Joseph Kaye Wood, they represent actual experience and are especially valuable on that account.

The use of "Roller Tools in Finishing Axles" in an Indiana railroad shop will show the latest practice along this line. It shows the tools in detail.

Then there will be a short story on "Axles for Airplane Landing Gear" and an outline of the "Evolution of the Split Pulley," as well as an interesting article on "Grinding with a Phantom Wheel." Among the serials will be "Modern Production Methods" and "Tool Engineering."

In this issue page 16, Colvin winds up his talks on the "Foreman and His Job." Not that he's exhausted either the subject or himself, but because he doesn't believe in playing too long on one string. This deals with that half mysterious factor of human nature which the professor calls psychology.

As Colvin says "Most of us would have a hard time defining what it is in language that would mean anything to a man who didn't already know what we were talking about." He points out the difference in temperaments and the necessity of understanding them and points out the value of the open court such as General Goethals held Sunday mornings in the Panama Canal Zone, where all hands could get next to the big boss and spill their tale of woe. He agrees with Gladstone who said: "The free expression of opinion is the safety valve of passion. The noise of the rushing steam when it escapes alarms the timid; but it is the sign that we are safe." He believes that satisfied workers have no time for the agitator.

The eleventh paper on "Tool Engineering" on page 18, includes indexing pins, plungers and latches of different forms and for various purposes. The examples show work from automobile factory practice as well as other kinds of product. The principal value of articles of this kind is to suggest other uses or adaptations and no toolmaker or designer can fail to pick up ideas for future use.

One of our good friends, C. F. Meyer, who has been visiting India, tells on page 22 of the machine industry in that far away country in a most interesting manner. Native labor is not cheap though wages are low, as the output per man is correspondingly small. The many castes interfere with anything like co-operation and altogether the shop manager has his problems the same as here.

The development of continuous milling has made possible higher production than we dreamed of a few years ago. The article beginning on page 23 shows a number of applications which will suggest many others to the progressive shop man. Then there are about the usual number of practical ideas and kinks from our various readers. Some consider this the best part of the paper—it certainly is worth reading.

EDITORIALS

Economics—Plus Faith

IT is a proper and wise thing to know your economics. A business launched with the sure knowledge that it is being begun at just the right point in the economic cycle; buying and selling accomplished in the same way; production increased or curtailed, not blindly, but because of knowledge that it is the right time to do so; these are things resulting from a thorough grounding in economics.

But there comes a time, it seems, even for the business run strictly according to economic rule, when a little something more is needed—when the turn doesn't come just as promptly as it should, and it appears that the bottom is going to drop. The additional thing needed is Faith—faith in the future. The present is such a time.

It is not a blind faith that is needed, not merely a waiting faith, but a faith with works. Back of the works, that they may be properly directed, must exist an understanding of how the world stands, inside our country and out. There must also be a realization that a large part of the country's condition of depression is psychological. Then we must know some things about the public debt and its relation to our wealth, what our real wealth consists of, and something of our national war time and peace time wastes. All of which may be said to constitute an analysis.

An analysis is easy to recommend but hard to make, and for that reason we have asked Theodore H. Price, editor of *Commerce and Finance*, who has been at the business of analyzing for a great many years, to make it for you. His report on the findings is our leading article this week. Mr. Price is strong for faith, as we are, and his reasoning makes us feel that he and we are right. So we recommend his medicine, full dose, believing it to be a good tonic.

A Few Rays of Sunshine

WHILE business isn't exactly what we might call brisk there are signs of life in many quarters. There is a little less unemployment in Cleveland for example, that's one good sign. Then there is a little machine business going on, some of it for export. This includes some machine tools and also woodworking tools, mostly for central Europe and in spite of the rate of exchange.

Some large machine tools are also being built for the making of electrical machinery and hydro-electric development. They are for the big companies and special to a great extent, but they indicate an abiding faith in the future which can well be copied by many of the smaller concerns. The big concerns are getting ready to do business in a more efficient manner than ever. This is also a good point to consider most carefully. As an indication of the orderly development of the business cycle, the night-shift operation of the knitting mills in certain districts is not without significance. First to be hit they are the first to get back. Others will follow.

The Improper Inspection of Machines

DURING the war when every machine builder was rushed to the limit, there was some excuse for slighted details and sub-standard and workmanship. The amount of business being done today hardly warrants such an alibi. And yet machines and accessories are coming through which are far from satisfactory.

One small shop we know of has had three exasperating experiences in as many months. They are, fortunately, busy enough to need new equipment, and it is discouraging, as well as maddening to have to spend a day or two in tinkering with every new machine in order to get it to run.

The first was a small punch press which absolutely refused to go on its base or stand. The base had never even been snagged and the upper works had never been put in place; huge lumps on the casting prevented the head from being put in the proper position.

Next came a bench lathe, which was equipped with a special toolpost although the standard had been specifically ordered. It was also fitted with a geared chuck which could not be opened or closed. It took a full day to take the chuck apart, lap the ring gear so it could be moved in its groove, file the rough corners off all the teeth of the gear and the three pinions, and make it usable. It had been forced together and never tested in any way.

Third, there was a sensitive drilling machine which was a beautiful job so far as the machine was concerned. But the drill chuck was considerably out of true because of a burr on the shank. When this was removed it was found that the tapers were not alike, and with such a difference that the chuck would not stay in the spindle.

These were not machines or tools made by war-baby machine builders. They all bear the name plate of well and favorably known concerns, some of which date away back in our machine-tool history. The same is true of the chucks referred to.

Exporters tell a similar story and it is unnecessary to point out that such neglect does not help to extend our foreign trade permanently or make for friendly relations with foreign buyers.

If these instances mean that war time laxity of inspection is still with us, we have a task at hand which needs immediate attention. Nothing makes for better business relations that to have machines complete and ready for work when received. The reverse is also true and nothing tends to divert trade more than the conditions mentioned.

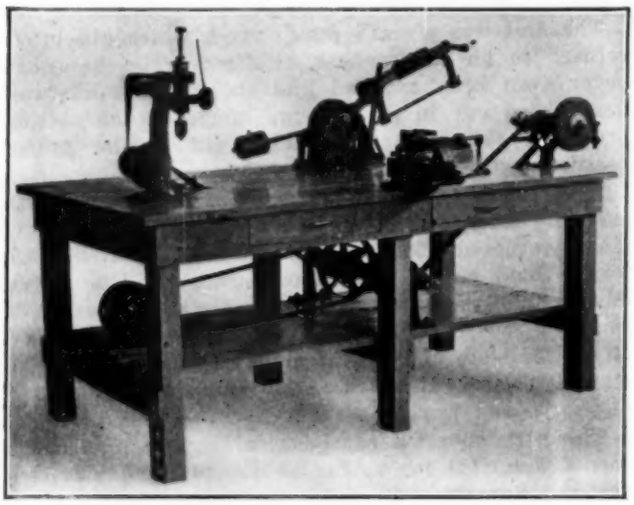
This is a good time to make sure that these conditions are not true of your shop and its product. For nothing tends to demoralize the men in a shop more than to permit carelessly inspected work to go out. If imperfect machines are allowed to pass now what can be expected when shops are busy once more? We must remember that satisfied customers mean more business later.

Shop Equipment News

Myers Combination Work Bench No. 1

The illustration shows the No. 1 combination work bench recently placed on the market by the Myers Machine Tool Corporation, Columbus, Pa. The outfit is intended for use where a small machine equipment is required, as in automobile repair shops and hotels, and by inventors and mechanics doing experimental and general work.

All of the units are mounted on a table 39 in. wide by 78 in. long by 33 in. high, the top, sides and shelf being made of 1¼-in. and the legs of 3 x 4-in. lumber. Two drawers are provided for holding small tools. The motive power is furnished by an a.c. electric motor,



MYERS COMBINATION WORK BENCH NO. 1

mounted on the shelf under the table, and delivering ½ hp. when running at 1,750 r.p.m. on 60-cycle, single-phase current of either 110 or 220 volts. The motor is belted to the countershaft, which permits the use of the machines either individually or simultaneously.

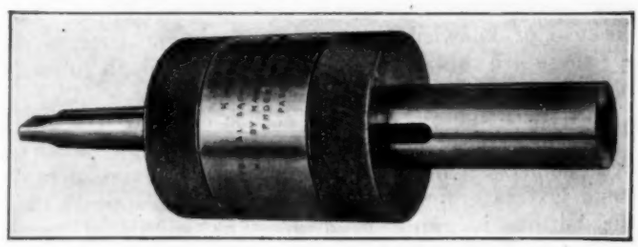
The machine equipment consists of the company's No. 2 geared automatic hacksaw having a capacity of 6 x 6 in.; a 10-in. sensitive drilling machine having a ⅜-in. chuck; and a grinding head equipped with one abrasive wheel and one muslin polishing wheel. A 4-in. machinist's vise having hardened steel jaws is also mounted on the table. The outfit is complete with the belting, and weighs 750 lb. when crated.

Karge "Universal Safety Cushion" Chuck

The illustration shows a chuck recently placed on the market by the Karge-Baker Corporation, Phoenix, N. Y., for the holding of drills, dies, taps and similar tools. It is provided with a "cushioning" feature which permits a moderate relative rotation between the shank and the socket ends of the chuck. A helical steel spring having a square section transmits the driving torque from one end of the chuck to the other, thus absorbing the shocks.

It is claimed that the use of the chuck largely eliminates the breakage of drills, taps and other tools, and because of the cushioning effect serves to eliminate chatter and to prolong the life of the cutting edges of the tool. It is said to act as a chip breaker when drills are used, and to provide a safety feature for such work as cutting threads to a shoulder with a die head.

The shanks and sockets can be furnished in the size

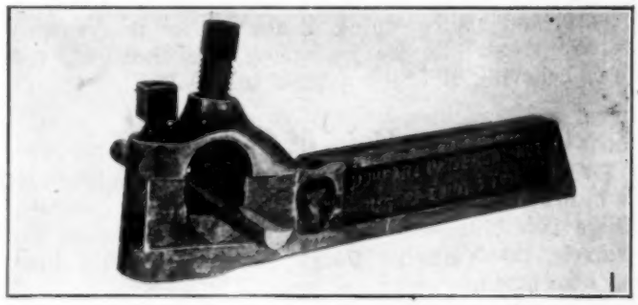


KARGE "UNIVERSAL SAFETY CUSHION" CHUCK

and style desired, and different styles are interchangeable on the chuck. The thrust is taken on double ball bearings, and an adjustment is provided to compensate for wear on the friction coil. The chuck is capable of operation in any position, and does not require lubrication. It is made in five sizes to carry drills from ¼ to 4 in. in diameter, taps from ¼ to 7 in., or die heads from ¾ to 9 in. in size.

"Uniheart Rapid Universal" Toolholder

The Rapid Universal Toolholder Corporation, 199 Franklin St., New York, N. Y., has recently placed on the market a toolholder intended for general use in a lathe, boring mill or shaper, and adapted to the



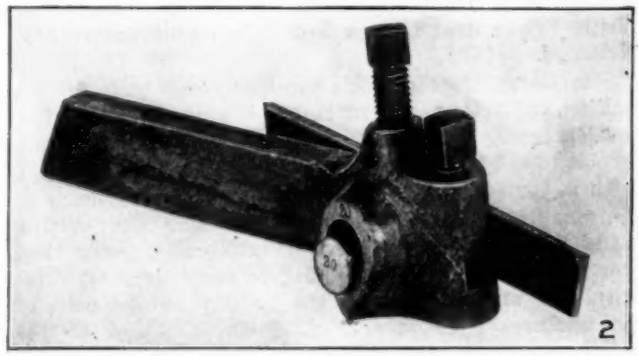


FIG. 1. "UNIHEART RAPID UNIVERSAL" TOOLHOLDER CARRYING A BORING TOOL. FIG. 2. PARTING TOOL IN "UNIHEART" HOLDER

holding of tool stock, boring tools, drills and such articles. The body of the holder is made of drop-forged steel, and is fitted with two setscrews.

As shown in Fig. 1, there is a square hole broached through at the front end of the shank, for the holding of square-section tool bits. When the tool bit is long, both screws can be tightened on it so as to prevent it from shifting. Round, square or hexagon bars can be held transversely to the shank by passing them through the hole and clamping them by means of the setscrew. For small bars the V-block shown in the illustration is placed in the rounded bottom of the hole, so as to hold the bar in place under the setscrews. It is thus possible to hold boring tools, drills, taps, center drills, reamers and indicator stems of any size up to $\frac{3}{4}$ in. in diameter.

For the holding of a parting or cutting-off tool, a special clamping device is provided. A conical-shaped piece with a groove at its large end to fit over the top edge of the toolstock is placed in the cross hole of the body. The small end of this clamping member can be seen projecting from the hole in Fig. 2. The appearance and construction of this part of the device gives the tool the name of "Uniheart." As the clamping screw is tightened, the parting tool is pressed downward on the shoulder supporting it, and is pulled against the side of the holder.

Besides the universality of uses of the toolholder, the maker claims that it is capable of very speedy operation, because the tools can be so easily changed. It is made in two sizes, the No. 1 for bench lathe use and the No. 3 for general medium-duty work.

Poliakoff "Universal" Machine Shop Rule

The rule shown in the illustration has recently been placed on the market by R. Poliakoff, 709 Sixth Avenue, New York, N. Y. The purpose of the rule is to enable the quick and accurate solution, without making any calculations, of problems relating to the speed of cutting work in a lathe or grinding it in a grinding machine. It is intended for solving the following problems, using only one side of the rule for any one problem.

(1) Given the diameter of the bar and the cutting or grinding speed; to find the number of revolutions. (2) Given the diameter of the bar and the number of revolutions; to find the cutting or grinding speed. (3) Given the speed in feet per minute and the number of revolutions; to find the diameter that can be turned or ground. (4) Given the length of bar in inches, feed in inches per revolution and number of revolutions per minute; to find the time required to turn or grind the bar. (5) Given the depth of cut in inches, feed in inches and speed in feet per minute; to find the volume of metal removed. (6) Given the speed in feet per minute and feed in inches; to find the area machined.

The chart on the side of the rule shown at the top of the illustration was described on page 590, Vol. 49, of the *American Machinist*, while the chart used on the other side was described on page 931, Vol. 50. The inch and millimeter divisions on the former side have been added to permit the use of the rule for measuring. The rule is made of celluloid, but can be made of steel, if desired. It is 12 in. long.

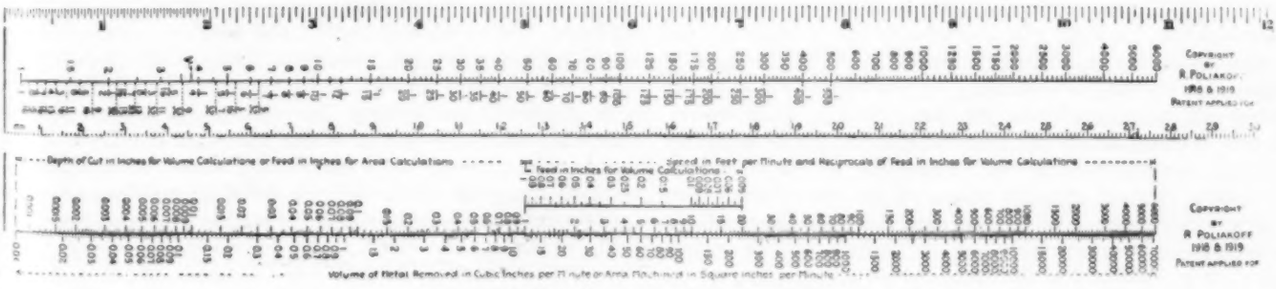
"Normal" Precision Drafting Instrument

A drafting instrument or compass intended for precision work and for general use on a drafting board has recently been placed on the market by E. Lawrenz, 2533 McClellan Ave., Detroit, Mich. The instrument is intended for the drawing of circles from $\frac{1}{16}$ to 12 in. in diameter; and by the use of an extension bar, circles

"NORMAL" PRECISION DRAFTING INSTRUMENT

24 in. in diameter can be drawn. In the accompanying illustration, the instrument is shown in its case with two non-hinged ruling pens, as well as with the extension arm and the pen attachment. Plain points are provided to insert in both arms of the instrument when using it as dividers. It is stated that the set is capable of performing all ordinary drafting work, since no small compasses are needed.

The principal feature of the instrument is the fact that the two legs are always parallel, or normal to the plane of working, hence the name of the device. Because of this fact, the centers of circles being described are not gouged out, as frequently occurs when the points strike the paper at an angle. The instrument can be quickly set to the radius desired, and is then readily clamped in position, so that the radius will not change while the circle is being described. It is said



POLIAKOFF "UNIVERSAL" RULE

that there is no back-lash or shake in the joints, as all of the pivots are of conic construction, made of steel and hardened and ground. The tightness of the joints may be adjusted by means of lock nuts.

The grip or handle is of large size. The grip is made of aluminum, while the working parts are made of steel, tool steel being used for some parts and mild steel for others. The arms are rust-proofed by either of two methods. The first is the Parker process, which makes the arms jet-black; the second is by electro-sheridizing, by which process a coating of zinc is amalgamated with the steel, leaving the instrument gray in color. The instrument is said to be very light and yet rigid; to be easily manipulated and capable of rapid work.

Rothweiler Oil Pump

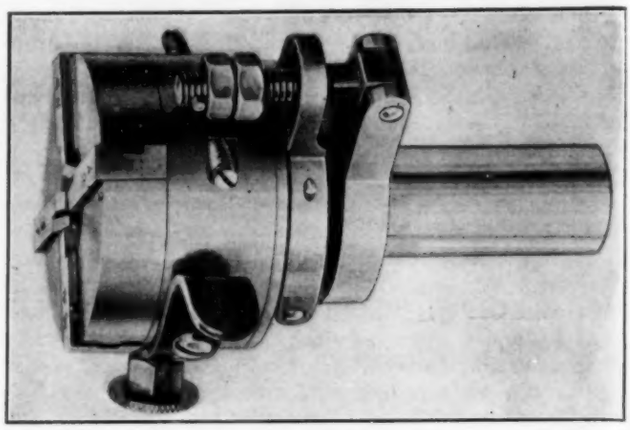
The illustration shows a pump recently placed on the market by Rothweiler & Co., 2962 First Ave. South, Seattle, Wash. It is intended for the removal from the container of oil of any grade, gasoline, turpentine, paint or other liquids. The suction pipe at the bottom of the pump is placed down in the container, and is long enough to reach through the head of a barrel to the bottom of it; and a bushing on it fits either the ¾-in. opening in a steel drum or a 1-in. hole bored in a wooden barrel.

ROTHWEILER OIL PUMP

The spout can be swiveled, being turned up after using, so that oil does not drop from it. The cylinder is made of seamless steel tubing, the valves ground, and oil-proof leather packings are used. The pump throws about a pint of oil at each stroke, so that 4 gal. per minute can be delivered, it is said. One of the chief advantages of the pump is that since the pipe reaches to the bottom, it saves the elevating of barrels in an attempt to drain the last of the oil through a faucet. The weight of the complete pump is 7 pounds.

Geometric Style DS Self-Opening Adjustable Die Head

The Geometric Tool Co., New Haven, Conn., has placed on the market the Style DS self-opening and adjustable die head shown in the illustration. This die head was designed primarily for use with the Brown & Sharpe automatic screw machine, but is said to be quite as well adapted to other automatics. One feature of the head is that the spindle does not have to be reversed to back the die head off the threaded work. The die head floats to suit the thread being cut, which is said to prevent stripping and shaving of the threads and makes the usual close camming of the machine unnecessary. Buffer springs allow the head to yield slightly when the chasers come in contact with the work, which is claimed to insure a good smooth thread from the start. Two check nuts at the side of the head provide easy adjustment of the point of tripping. A spring closing attachment is provided for the purpose of eliminating shock and wear. This attachment is located in a position to strike a stop on the machine, thus automatically closing the head when the turret revolves. Micrometer adjustment is provided. The die heads are made with shanks to fit the particular sizes of machine on which they are to be used. They are furnished in three sizes, ⅞, 1⅛ and 1¼ in., to fit Brown and Sharpe machines from No. 00 to No. 2 G. The work that can be cut varies in diameter from ⅛ to ¾ in., in lengths from 1¼ to 1¾ in. and in pitches from 10 to the fineness desired. The shanks are ⅝ x 1⅝ in. to 1 x 2⅜ in. in size.



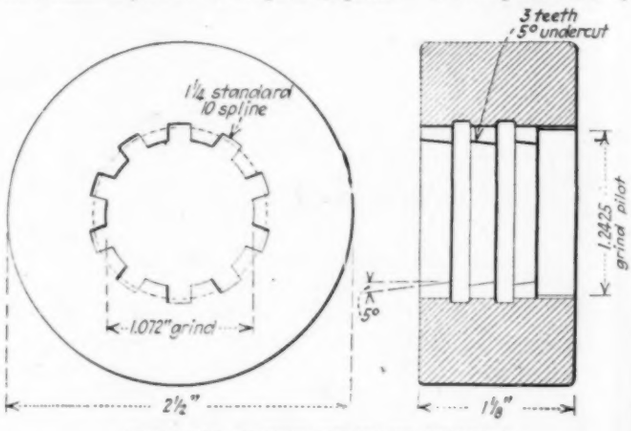
GEOMETRIC STYLE DS ADJUSTABLE DIE HEAD

A Spline Shaft Sizing Die

BY C. H. DENGLER

Mistakes are bound to occur in the best regulated shops. One that occurred in our shop was the means of trying a new method to bring spline transmission primary shafts to size.

The shafts, which were about 10 in. long and 1¼ in. in diameter, had a ten-spaced spline. On inspection they measured a few thousandths high, and as the gears had to slide easily on the shaft correct sizes had to be maintained. To reset and remill the shaft to the required limit was no easy job, especially as an alloy steel with a scleroscope hardness of 40 to 50 was used. We solved the problem by making the sizing die shown in the sketch and pressing the shafts through it on the arbor press, thus producing a shaft of the correct diameters.



DIE FOR SIZING SPLINED SHAFTS

The drawing needs only a word in explanation. A tool steel piece was bored and broached, a pilot provided for entering the work, and recessed to make three teeth for cutting, which were backed off at a 5-deg. angle. The die was hardened and the pilot teeth ground.

Manufacturing With Special Machines vs. Standard Equipment

I—Artillery Recuperators Made in Separate Plants Differing in Equipment—Heavy Forgings Machined to Close Limits—Special Machine Tools Built in Short Time

By COL. G. F. JENKS* and M. H. CHRISTOPHERSON†

THE 240-mm. howitzer carriage was the largest type of field howitzer manufactured for the American army during the World War. The howitzer fires a 356-lb. shell with an initial velocity of 1,700 ft. per second, the maximum range attained being about 17,000 yd. The howitzer itself weighs 10,800 lb. In firing, the howitzer is allowed to recoil a distance of 45 in. along the cradle, and during this recoil a restraining force of about 183,000 lb. is continuously exerted.

The mechanism which restrains the howitzer in recoil and returns it to battery has been commonly designated as the recuperator, although strictly speaking this is not accurate since the term expresses only one function of the part, that is, the recuperation or return into battery.

In order that movement of the howitzer during recoil and counter-recoil shall be entirely smooth and without shock, the recuperator, as we will now refer to it, must be very accurately made. All interior parts are highly finished and closely fitted. It will be appreciated that in order to control the great force just mentioned the mechanism must also be very powerful.

The subject of the following article is the machining of the large forgings out of which the bodies of the recuperators are formed. These forgings as they come from the forge shop are of a somewhat rectangular section and weigh about 17,000 lb. each. They are carbon steel, although some of the forgings first supplied were of chrome-nickel steel. As it is necessary that the interior of the recuperator shall be highly polished and without scratches or defects of any kind, the steel must be very homogeneous and easily machinable. It is prescribed that the physical properties shall be about 42,000 lb. elastic limit and 80,000 lb. tensile strength.

The large forgings weighing 17,000 lb. are reduced to a weight of about 5,000 lb. during the machine operations. It will thus be seen that a very great amount of metal must be removed and it will for this reason be especially interesting to note the processes used.

After preliminary negotiations a contract was finally given the Otis Elevator Co. on Dec. 22, 1917, for the manufacture of 814 of the recuperators, this order being increased to 1,039 in the following January. The informal order for the company to proceed with manufacture was given about the middle of November. An order was also given the Watertown Arsenal on Sept. 1, 1917, for the manufacture of 250 of the recuperators, which order was in July, 1918, increased to 532.

The methods of manufacture followed by the Otis Elevator Co. and by the Watertown Arsenal were radically different. As will be described later, the Otis Elevator Co. decided that the work was quite suitable for handling on single-purpose machines and this feature of manufacture at its plant should be carefully noted. The various operations were studied and for practically all of them special machines were designed and manufactured which would insure accuracy in work and the least loss of time in adjusting the different set-ups. The equipment designed for the operations met every expectation and the loss due to errors in machining was practically negligible.

As the number of recuperators ordered from the Watertown Arsenal was considerably less than ordered from the Otis company, it was felt the order could be satisfactorily performed by using standard machinery. It will be seen that the work was actually accomplished with machinery practically all of standard types, the Arsenal having expended about $700,000 in the procurement and installation of machine tools, jigs, gages, etc. At the Chicago plant of the Otis Elevator Co. about $2,000,000 was expended in the increased facilities provided for this manufacture. Not all of this was applied directly to the purchase of the single purpose machines and fixtures, but as most of it was so applied, a fairly good idea can be obtained as to the amount of preparation made at the two places.

The reader should note the general use of heavy-duty milling cutters at the Otis plant. It must be conceded that by this means metal was rapidly removed and at the same time the somewhat difficult contours formed with a minimum loss of time in making set-ups and machine adjustments. The Watertown Arsenal perperformed these operations very largely by the use of planers. While various comparisons might be made as to the relative merits of the planer or milling machine, the reader is left to draw his own conclusions but he should note that all the various factors must be considered in any effort to establish preference. The initial cost of milling cutters is, of course, very great and their use must depend somewhat upon the volume of work to be done. Once having constructed the cutters, the machining is rendered very simple and is probably faster than by planing. The tool equipment for the planer is, however, relatively inexpensive. The volume of work is the important consideration.

One is tempted to make comparisons of cost under the two systems of manufacture. Figures are presented on this feature of the manufacture but it cannot be said they are conclusive, as cost is a very indefinite thing, especially where we are including cost of initial equipment and overhead as well as the direct labor involved. In calculating the direct labor and machine costs, both plants were put as far as possible on the same basis so that the figures obtained would have a comparative value. Investigation of comparative costs at the two places indicates that the cost of labor and material was approximately 10 per cent less at the Watertown Arsenal but it is felt that while the comparison is interesting, it will be difficult to form a positive con-

*Chief of Artillery Division, Ordnance Bureau, U. S. A.
†General works manager, Otis Elevator Co.

clusion as to comparative merits of the respective systems of manufacture.

In order to give the reader an idea of the somewhat intricate interior mechanism of the recuperator, in Fig. 1, he will find a longitudinal section showing the parts in their assembled positions. The view presented is a section through the recoil cylinder and the counter-recoil or recuperator cylinder. Actually, there are two recoil cylinders. The view does not show the two reservoir cylinders which are contained in the same forging.

In the fall of 1917, after a conference with General Crozier it was decided to equip the Otis company's vacant shops in Chicago with suitable tools for heavy artillery work and to relieve M. H. Christopherson of his duties as general works manager and assign him to the handling of this work in co-operation with E. A. Russell, the vice-president. Later in October Colonel L. T. Hillman (now deceased) and Major E. Tyden, after an inspection of the Chicago plant, decided that the heavy construction of the buildings and cranes were well suited for handling the 9.5-in. Howitzer recuperators, and on Nov. 10, 1917, the Otis company submitted its proposal for the large size recuperators. Several days later Colonel Hillman gave verbal instructions to proceed with the work. December 22, 1917, Purchase Order War Ord. CF-388 was issued for 814 recuperators with tools and accessories for 9.5-in. (240 mm.) Howitzer carriage, Model 1918 (Schneider), including an appropriation by the War Department to cover repairs and alterations to the plant, the purchase of machine tools and equipment, and for the cost of manufacture of the recuperators with the company's profit, on the "cost plus fixed profit basis." Early in 1918 the Procurement Division, Washington, D. C., decided to increase the order to 1,039 recuperators, and the order was issued on Oct. 1, 1918.

The preliminary planning for the work was commenced in October, 1917, and resulted in placing orders with the Otis Elevator Co., New York, for a lot of special machine tools for machining the recuperator sleighs. The order also included the necessary motors and starters which were supplied by the Yonkers works. This equipment is illustrated and described in connection with the machining operations in the second article.

Early in our study of the drawings and the machining of the sleigh, which was the principal part of the recuperator, we were forcibly impressed with the difficulties we would encounter in promptly securing suitable machine tools and we also had in mind the fact that each machine table should have a suitable holding fixture into which the sleigh could be readily placed and that would accurately locate it, so each succeeding machine operation would co-ordinate with the work previously done. The need for extremely accurate workmanship, the shortage of experienced mechanics, and the haste in which the finished recuperators were required led to design and make so-called single purpose machines with fixtures and tool-setting gages that would be better suited for each operation than would be possible to secure in standard machine tools.

Nine types of special machines were decided on and A. C. Smith, works engineer, with his staff in Yonkers, N. Y., was assigned to prepare the detailed drawings and to follow up the work in the company's shops. Altogether 134 heavy machine tools were made, and to expedite delivery the machines were so designed that the beds, tables and many minor parts for the various types were cast from the same patterns with a minimum amount of pattern changes.

The company's standard elevator worm gear drives were used as far as consistent with the requirements; this not only saved considerable time in producing the machines but also developed an astonishing degree of efficiency, particularly in the milling machines, where great reduction in speeds between the driving shaft and cutter arbors was required. The use of spur gears was unnecessary and the constant smooth motion of the worm gear drive, coupled with arbors and driving shafts of liberal dimensions, had pronounced beneficial effect on milling cutters. The vibrations or chatter caused by spur gears generally used on milling machines, with its disastrous effect on high-speed steel cutters was eliminated, resulting in greatly reducing the usual replacements and grinding of cutters.

Simultaneously with designing of the machine tools, the designing of holding fixtures, setting gages and milling cutters, also the various portable machine tools, was carried forward and it is to Louis J. Kirchenbauer that the greatest credit is due for his foresight throughout the entire job, in providing the ingenious devices that proved so successful in making it possible both to speed up the work while maintaining accuracy in workmanship and to greatly reduce the number of possible errors by the machine operators.

The ordnance works in Chicago was engaged 100 per cent on the recuperator contract and all general expenses

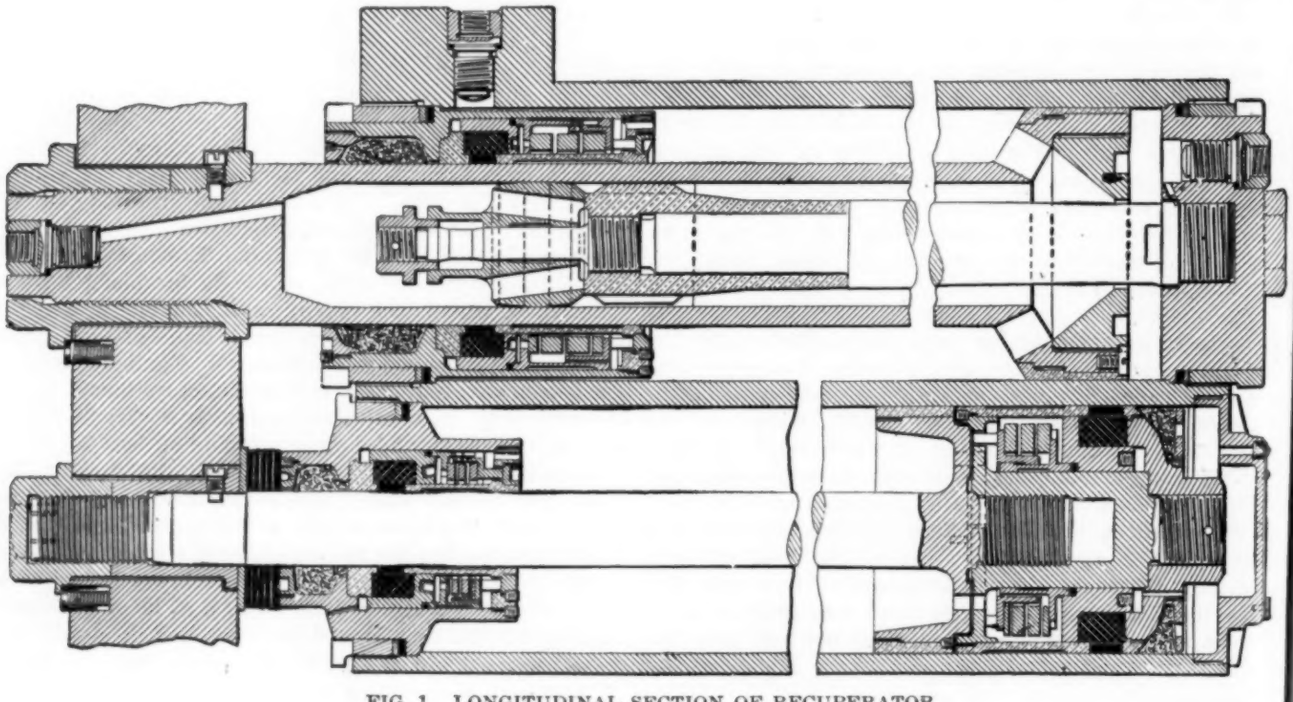


FIG. 1. LONGITUDINAL SECTION OF RECUPERATOR

and the entire payroll, together with the tools and necessary equipment, was paid for by the Government.

Machine work on the sleigh which forms the principal part of the recuperator, also the brake piston, the recuperator pistons and rods and the throttling rods; the final machining of piston liners, the fitting, assembly and testing of the recuperators was all done by the ordnance works as shown in illustrations distributed throughout the articles.

The shops used in Chicago were formerly part of the company's works that were vacated several years before and it was necessary to make building alterations and repairs before tools could be installed and operations begin. Consequently, the entire shop organization from superintendent to sweeper had to be recruited.

Observers Sent to French Arsenals

In June, 1918, the War Department concluded to send several men from the plants in this country, where the various sizes of French design recuperators were being made, to the arsenals in France to learn the methods used there in the manufacture of the same apparatus. F. H. Blanding was selected from the ordnance works to spend several weeks on this mission and considerable data was secured relating particularly to the relative importance of the various component parts, and on his return, the commanding officer, Watertown Arsenal, whose engineering division was responsible for the specifications for materials and accuracy in dimensions of the various parts, called a meeting to discuss workmanship tolerances of the sleigh and component recuperator parts.

The result of that meeting made it possible to proceed with the work to much better advantage, and credit is due Major P. J. Ryan and F. Brauer of the arsenal for the practical manner they adopted in promptly carrying out their own conclusions, based on evidence presented, and for the consideration which they gave to the various suggestions presented by the manufacturing heads at the arsenal and our ordnance works. Practically no advantage could be taken of the manufacturing methods used in France as presented by the committee sent to its arsenals or by the engineers and others who were sent here from the French arsenals as it was evident that in France no effort was made to produce in quantity or to maintain interchangeability of parts, which seemed to us so very important, as it had a direct bearing on the amount and accuracy of the work performed.

Shortly after the signing of the Armistice orders were issued to discontinue work on all recuperators in excess of 280, and War Order CF-388 was reduced from 1,039 to 280 recuperators with tools and accessories and the parts that were in process of manufacture. This number of sleighs and sets for small parts were completed, but three sleighs developed forging defects in the hydrostatic test and were rejected, consequently only 277 recuperators were assembled when work was discontinued.

The first seven sleigh forgings were received from the Carnegie company April 24, 1918, and work was started on machining the first sleigh on the same day. The final gymnasticator test on the last finished (277th) recuperator was made June 17, 1919. Machining of recuperator small parts was completed by the Otis Elevator Co.'s Yonkers works April 26, 1919.

Using Motion Pictures to Aid American Business in China

By JULEAN ARNOLD
Commercial Attaché, American Legation, Peking, China

The new era in trade development work places the motion picture film in a very conspicuous position. Business interests have not yet realized the marvelous results which can come through the use of the motion picture film in advancing their trade. This is especially true when used in a country like China where, because of the language situation, it is difficult to get a message to these people on the printed or typewritten page or even by word of mouth.

When the Silk Association of America wished to impress upon Chinese growers and producers the fact that they could sell five and six times as much Chinese silk in the American market over what they had been selling in the past if they would produce the standard American skein, they sent their representative to China with a motion picture film setting forth the methods of preparation of silk in other countries where the standard American skein was produced, and the conditions in the manufacturing industry in the United States requiring this particular skein. When this film was displayed in the silk producing centers of China, thousands of silk men came to see the pictures and incidentally learned the requirements of the American market, with the result that within a few years 25 to 30 per cent of the silk manufactured was prepared in accordance with the requirements of the American industry. Had the silk association spent ten times the amount of money on having elaborately printed and illustrated pamphlets sent to every silk producer in China, or had they contented themselves with sending their representative to talk to the Chinese silk producers about the requirements of the American market they would not have made one-tenth the impression produced.

The American commercial attaché has been trying for five years to secure from American manufacturers, merchants and commercial organizations, industrial and educational motion picture films for use in Chinese Chambers of Commerce, Chinese educational institutions and among the Chinese business public, to advertise in the most effective manner American materials, methods and standards. The response to the request for such films has been most discouraging. Our business interests have not yet awakened to the wonderful results which can be achieved through the proper exploitation of the motion picture film in the development of foreign trade. They seem to be under the impression that because the American people generally are not interested in witnessing industrial and educational films, that peoples elsewhere are equally indifferent. Probably the trouble in America in connection with the display of industrial and educational films has been that the subjects were not selected especially for special groups of people. Undoubtedly our commercial organizations would be glad to replace the ordinary business noon-day functions with a display of well selected motion picture films, or at least to use these films in connection with their noon-day half-hour educational programs.

So far as the Chinese people are concerned, very little interest is taken in American photoplay films, principally due to the fact that the American social customs are entirely different from those of the Chinese. Incidentally we might mention that the American photoplay films displayed in China do America far more damage than good, for the reason that they convey to these people a distorted idea of American social life. Chinese who view these films undoubtedly carry away the impression that the shooting scrapes and other sensational features as shown on the screen are characteristic of American every-day social life. We can do a wonderful amount of good work in a big way for the furtherance of American trade and American interests generally abroad, through the intelligent use of well-selected industrial and educational films, entrusted to men qualified to handle their distribution.

The office of the American commercial attaché in

China should have a man attached to its organization who would devote his whole time to the distribution and display of American industrial and educational films in this country. He could advantageously use a thousand films, and the results which would accrue would be many fold greater than possible with an equal expenditure of money in any other way. The commercial attaché is receiving hundreds of expensively printed and illustrated American trade catalogs in English, and occasionally receives some printed in Spanish. He also receives from American manufacturers hundreds of letters written in great detail descriptive of their products, and imploring assistance in the securing of information useful in extending this trade. American manufacturers send men to China who are unable to meet with many Chinese for the reason that they cannot speak the language, so that they are unable to satis factorily transact business. The motion picture film would be of great assistance to these men in carrying their message to the Chinese people.

Similarly, a big educational work in a trade way could be carried on in America through motion picture films descriptive of Chinese products, Chinese life and things Chinese generally. These would help the American manufacturer to understand the needs of the Chinese market, to appreciate the sources of supply which China has to offer in certain raw materials, and would be valuable factors in the development of his interests in this country. These films displayed at noon-day luncheon functions throughout the country would do far more than anything else to educate Americans to a better understanding of a country which possesses one-quarter of the world's population and promises to us the greatest market for our manufactured goods.

Methods of Procedure

As to methods of procedure: (1) The Department of Commerce should be furnished with funds to defray the expenses of a well qualified man to be attached to its organization in China. He would devote his entire time to the distribution and display of American industrial and educational films throughout the country.

(2) Arrangements should be perfected which would make possible the securing for display in China of a thousand well-selected industrial and educational films which, after their arrival in China, should be prepared with captions in the Chinese language and arranged for systematic distribution throughout the country.

(3) The Department of Commerce should be given the funds necessary for the collection of forty to fifty thousand feet of film depicting conditions in China in a way to best portray to the American manufacturing and business men the opportunities in trade which this country offers and the best methods of meeting these opportunities. Some of this material could be purchased while others would have to be produced at first hand.

(4) Our American commercial organizations such as the Chambers of Commerce of our various cities, should appoint a man in each community to devote his full time to the securing of industrial and educational films which would serve to advance the interests of the manufacturers and business men of that section when displayed throughout the commercial centers of China.

It must be borne in mind that China is now at the inception of modern industrialism—at the parting of ways—and is ready to accept from the West all that the West has to teach by way of modern industrial, commercial and scientific development. The people have no machinery or ideas to scrap. They can begin where we are and carry on with the best and most advanced that we have, with no preconceived ideas of modern industrial commercial methods and materials. Twenty-five years hence they will have established their ideas, standards and methods in a modern industrial and commercial sense, and will not then be so receptive to new suggestions and ideas. Hence *now* is the psychological time to impress upon the Chinese mind the value of the standards and materials of the American manufacturing and commercial world. The motion picture film furnishes the best medium for this purpose and we will be stupid indeed if we fail to take advantage of the wonderful results which can be achieved through the use of the motion picture film in bringing America to China and in carrying China to the United States.

Making the Public Appreciate the Plant

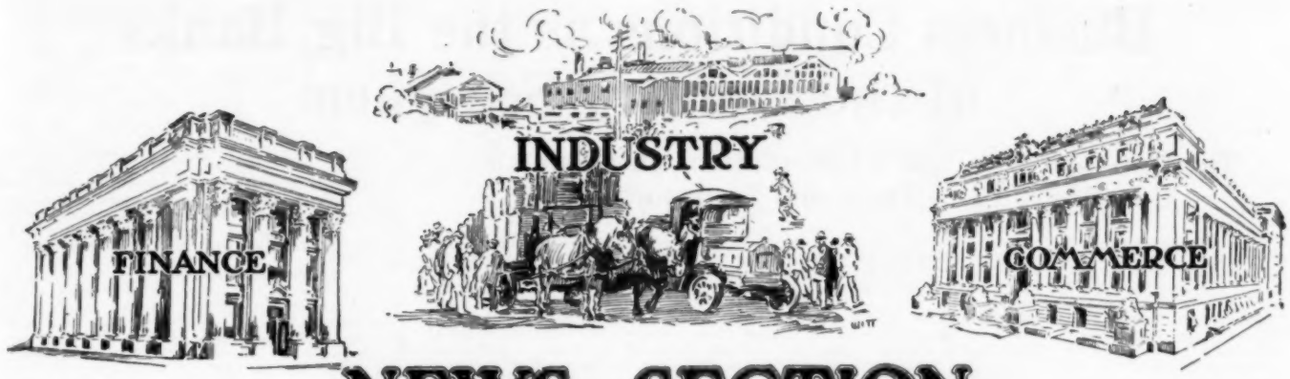
By Frank H. Williams

Of course the relationship of a plant to its employees is highly important and is always emphasized when the industrial management of a plant is being considered. But the relationship of a plant to the community in which it is located is also extremely important, although this phase of plant management is very seldom talked about.

It is, perhaps, not too much to say that the united public opinion of the community in which a plant is located can almost "break" any average plant. So it becomes evident that it is well worth while for the plant to cultivate the good will of the citizens by every means in its power. One of the main reasons why a plant sometimes gets in bad in a community is its air of aloofness. When a plant very evidently wears a label, saying, "We are sufficient unto ourselves; we want no intercourse with the townspeople. We don't want to associate with them, and we don't want them coming around pestering us to let them go through our factory," then it is pretty certain that the townspeople will take pleasure in nagging the plant whenever possible and in continually doing their utmost to thwart all the plant's aspirations and efforts.

It is a mistake, as a general thing, for a plant to be superior to the community. The plant may be the mainstay of the community, and it may feel that without its presence the town will go to pot, still the plant must not be too "up stage" if it wants to prosper in the way that it should prosper. Folks, as a rule, like to feel that the factories in their community are as much interested in the growth of the town, in its various organizations and in its welfare as are the more humble citizens who have no connection with the plant. Folks generally feel proud of the factories in their towns, and the more they know about these plants the prouder they will be and the better the standing of the plant in the community will be.

It pays, for instance, to stage something for the general public or for various organizations of the public every now and then. If the town is too big to do something for all the folks in the town, then it is perfectly possible to do something for some leading organization of the city and through this organization to get a message about the plant into the local newspapers which will be calculated to increase the pride of the townspeople in the institution.



NEWS SECTION

Proposed Tariff Rates for Machine Tools, High-Speed Steel and Automobiles

Machine tools and parts of machine tools are made dutiable at 35 per cent ad valorem in the tariff bill which was reported favorably to the House of Representatives by the Committee on Ways and Means on June 30. This is 20 per cent higher than the existing rate of duty and 5 per cent higher than that provided in the Payne-Aldrich act of 1909. The bill as reported to the House contains the proviso that machine tools shall be held to mean any machine operated by other than hand power, which employes a tool for working on metal.

Steel Ingots Higher

High-speed steel is included in paragraph 304 of the bill which provides duties based on the value. This duty ranges from two-tenths of one cent per pound when the ingot and the steel in other forms is valued at not over one cent per pound, to six cents per pound when the ingot is valued above 32 and not above 40 cents per pound. If the ingot is valued above 40 cents per pound the duty is to be 20 per cent ad valorem. In addition to that duty the present bill provides that a duty of 15 per cent ad valorem be levied when the amount of tungsten or other alloy exceeds six-tenths of one per cent. Under the existing law the duty is 15 per cent ad valorem. The Payne-Aldrich rates are not exactly comparable because the range of values in that law began on ingots valued at three-fourths of a cent per pound, on which seven-fortieths of a cent per pound was assessed as duty. The rates are comparable, however, on ingots valued above 24 cents and not over 32 cents. Steel coming within those values was dutiable at 6 cents per pound under the Payne-Aldrich act but the present bill provides only 5 cents per pound. Steel valued above 32 and not over 40 cents per pound was dutiable at 7 cents per pound in the Payne-Aldrich act but is put in at 6 cents per pound in the present bill. The Payne-Aldrich act also provided a 20 per cent ad valorem duty on steel valued above 40 cents per pound.

Autos Lower

In the present bill automobiles and parts are made dutiable at 25 per cent ad valorem. This is a reduction from both the existing act and the Payne-Aldrich law. The Payne-Aldrich rate of duty was 45 per cent. The Underwood duty also was 45 per cent on automobiles valued at $2,000 or more but provided a tariff of 30 per cent on automobiles valued at less than $2,000. Value is not considered in the present bill but a proviso is inserted that an additional duty may be added to equal the duty imposed by any country on similar articles imported from the United States, but in no case is the duty to exceed 50 per cent ad valorem.

Penn R.R. Reopens Logansport Shops

Announcement of the recall of 250 shop men of the Logansport division shops of the Pennsylvania was made at Logansport, Ind., recently by officials. It is expected further recalls will follow. The 250 men who will return to work will include machinists, machinists' helpers, boilermakers, blacksmiths and their assistants together with employees of the repair department.

Annual Convention of the American Drop Forge Association

The combined eighth annual convention of the American Drop Forge Association held jointly with the Drop Forge Supply Association, was held in Chicago June 22, 23, 24, 1921. Shortly before the convention, plans for holding the meetings were changed so that they were held at the new Hotel Drake instead of at the Congress Hotel, for which they were originally scheduled. The officers of the Drop Forge Association are: president, Ferdinand Barnickol, Indianapolis Drop Forging Co.; vice-president, J. P. Hopkins, Atlas Drop Forge Co., Lansing, Mich.; secretary, E. B. Horne, Detroit. The local committee in charge of arrangements was under the chairmanship of Samuel M. Havens, of the Ingalls-Shepard Forging Co., Chicago, Ill.

By prior arrangement the business and program sessions were largely held in the morning in order that attendance at them might not grow too irksome; and the afternoons were devoted to plant visitation trips. Among the papers presented were "Twenty-Five Years of Forging Experience," by C. E. Adams, Cleveland Hardware Co.; "Some Experience in Industrial Co-operation," by Arthur H. Young, International Harvester Co.; "Board Versus Steam Hammers," by R. T. Herdegen, Dominion Forge and Stamping Co.; "The Necessity of Proper Cost Accounting," by J. B. Sehl, Billings & Spencer Co.; and "Previous Changes in Price Levels and Probably Results of This One," by Col. Ayres, Cleveland Trust Co.

At the Friday session another group of papers was presented including "Manufacture of Steel," by John Bruner, Illinois Steel Co., "Electric Furnaces, Heat-Treatment of Dies and Forgings," by E. F. Collins, General Electric Co., and "Furnace Conditions for the Proper Heat-Treatment of Die Blocks," by Dr. Trood, Tate-Jones & Co., Inc.

Owing to business conditions the Drop Forge Supply Association did not have as large an exhibit of supplies as they have shown in some previous meetings. However, there was a full attendance of this association's members and they brought an abundance of enthusiasm to help push things along and aid in getting business restarted in this industry. The officers of the supply association are: President, H. N. Taylor, N. & G. Taylor Co., Philadelphia; vice-president, C. D. Harmon, Jr., National Machinery Co., Tiffin, Ohio; secretary-treasurer, A. L. Wurster, N. & G. Taylor Co., Philadelphia. The location of the next meeting will be announced later.

Machine Casting of Pig Iron Is Successful

Birmingham pig iron has earned reputation for itself in the new form in which it has been turned out by the Alabama company since the installation of the Heyl and Patterson machine casting process at its Gadsden furnaces.

By the casting machine process the pigs are turned out in uniform size of about 35 to 40 pounds in weight and are absolutely free from sand and dirt. Many consumers of Birmingham iron had not heretofore used machine cast iron in merchant foundries and some were prejudiced against its use because not accustomed to it.

The company sent out more than a hundred letters to its customers requesting their opinion of the machine cast metal after testing it and the replies all praised the quality of the metal.

U. S. Chamber of Commerce Urges Standardization of Machine Tool Sizes

The following statement from the Washington office of the U. S. Chamber of Commerce has been received at the headquarters of the National Machine Tool Builders Association, Cincinnati, Ohio.

"Every live, progressive business man no doubt has had anxious moments since price declines put business out of alignment, and he has had to study to know 'What to do,' and 'How to do it' to improve the situation.

"Have you thought that possibly your line is made in too many styles, sizes and varieties which destroy the operation of that profit-making fundamental, *small variety* and *large volume*?

"The Conservation Division of the War Industries Board during the war, with the voluntary co-operation of many lines of industry did a splendid job of cutting out unnecessary varities. One large manufacturer, whose inventory is 30 per cent less because of adherence to the Elimination Schedule for our line, and we are giving our trade better service.

"Here are a few savings and advantages: Release 'frozen' capital; hasten 'turnover'; simplify and aid distribution; make lower prices possible; reduce depreciation and obsolescence; make for efficient sales forces; a uniform and better product; reduce overhead; reduce storage and handling; better service to, and by, the dealers.

"This work can best be done through Trade Associations representing specific lines, but will make better progress through co-operation and information interchanged."

This letter has been sent broadcast throughout the country to the various technical and trade associations and to builders of machine tools and machinery. It is expected that many associations will consider the suggestions offered by the chamber in the letter.

C. E. Davies New Editor of "Mechanical Engineering"

The American Society of Mechanical Engineers announces the appointment, as managing editor, of C. E. Davies to succeed the late L. G. French, who was both editor and manager of the Society's publication. The June Issue of *Mechanical Engineering* contains a symposium of eulogies on the work of Mr. French, including resolutions of appreciation adopted by the council of the society and by the boiler committee.

Mr. Davies was graduated from the Rensselaer Polytechnic Institute with a degree of M. E. and for several years afterwards specialized in industrial management work. He became associated with the Smith Premier Works of the Remington Typewriter Co., Syracuse, N. Y., in 1914, and with the exception of fifteen months during the war was engaged in production work with that company until March, 1920.

During the war Mr. Davies was in the Ordnance Department at the Frankford Arsenal, serving as assistant production superintendent on the Artillery Ammunition Division and later as superintendent of the fuse shop. He left the service with the rank of captain.

Mr. Davies joined the editorial staff of the society in March, 1920, as associate editor of *Mechanical Engineering* and assistant secretary in charge of meetings and publicity.

Business Conditions as the Big Banks of the Country See Them

The National City Bank's Observations on Economic Conditions, Price Trend and Transportation

The general trend of business and industry during the month of June has been quiet and repressed. Some further hopeful signs have appeared, side by side with others which give less encouragement.

The plain truth of the thing is that the recovery of business, for which everybody has been hoping and waiting since the depression began late last year, has not yet materialized. No one's interests will be furthered by an ostrich-like attitude which buries its head in undue optimism, and makes glowing predictions for the immediate future, predicated wholly on a magnifying of the favorable symptoms. It is easy enough, and pleasant enough, to lull anxiety by such a process of reasoning, but what is wanted now is a general realization of the obstacles that must be met and overcome, more than a light-hearted prevalence of optimism founded only on half truths.

Undue Pessimism Harmful

On the other hand, an attitude of unwarranted pessimism can be just as harmful, if not even more so. We know that our banking system is intrinsically sound, and that it has already proven its capability to withstand the shock of a period of extraordinary strain, and to emerge unscathed from the most difficult test imposed in many years. We know that our ability, as a nation, to produce the raw materials which our people need, and which the world must buy from us, has been in no wise dwarfed. We know, finally, that our industrial and business organization is geared for production not only ample for our own needs, but on sufficiently large proportions to make export on a considerable scale a necessity.

These are fundamental facts, so plain that they cannot be misinterpreted. It is hard to understand how, knowing the foundation upon which our business life rests to be as rigidly secure as it is, there can be any doubt as to the final recovery. It is progressing no more laggardly now than in 1903 and 1904, when we were passing through a somewhat similar period, or in 1907 and 1908.

Recovery is certain to be slow. Where the artificially stimulated optimist makes his mistake is that, seizing upon a few favorable but quite natural events, he seeks to make them the basis of predictions that the final turn in the road has come, and that next week, or next month, the difficulties into which business and industry have fallen will have lightly drifted away.

Adjustment Question Paramount

It is primarily a question of adjustment between the various component parts in our economic structure. As has been pointed out in these pages before, a great portion of the population—particularly that portion concerned with the production of agricultural commodities—has had its purchasing power bisected by the drop in commodity prices. Finished products have shown no such decline. The result has been that that portion of the population which has had its purchasing power reduced by two is buying only half as much of those products which have not declined materially in price. Industrial stagnation and unemployment has been the inevitable consequence.

Although the process of bringing the price of farm products and manufactured articles into equilibrium must be slow and even painful, the fact does not mean that everyone can sit down, fold their hands, and wait for some mysterious set of economic forces to make things normal again. The result will come most quickly through the combined efforts of everyone, and the sooner every man and woman in this country who either receives wages or pays wages realizes and operates on the basis that the unbalanced state of industry as regards compensations received by important bodies of people must be overcome, the sooner will the real, sound revival of business begin in earnest. It is important to think about the proposition, but it is utterly essential to act upon it.

An examination of any of the particular industries which, because of their basic relationship to the whole industrial structure are considered "key" industries, only shows all the more how this condition of unbalance is backing up its effects all along the line. The iron and steel industry, for example, is operating on a basis variously estimated at from 20 to 30 per cent of normal capacity—the lowest stage the industry as a whole has reached in any year during the present century. Production throughout the year would indicate a total of 13.5 million tons of finished rolled steel products for 1921, as contrasted with some 24.8 million for 1913, and 32.3 million for 1920.

There seems little reason for doubting the assertion that production is not only far below normal consumption, but is likewise considerably below current consumption. Stocks that have been accumulated are being eaten into, and there is doubtlessly a heavy demand that is being deferred until, in the current phrase, "business picks up again." A part of the deferred demand will have to exhibit itself positively in the near future regardless of the general condition of business; purchase on a scale comparable with the present low ratio of consumption cannot be indefinitely sustained.

Reduction in prices that have been accomplished thus far have evidently not stimulated the aggregate present demand. It is contended that the stagnation is not the result of price levels obtaining in the industry, but of business conditions generally.

Price Trends

That prices have a psychological aspect, as well as physical, was never better illustrated than at the present moment. The high peak reached during the war, followed by the very drastic reductions in many commodities, has stimulated a state of mind which, expectant of still further reductions all along the line, occasions that degree of purchase described as "hand-to-mouth." Everybody defers as long as possible the purchase of everything possible. The result is felt in every line of business.

While it is clear that the prices of many products have now reached rock bottom, the situation we are at present experiencing only serves to emphasize more vigorously the necessity for establishing equilibrium, on a stable price basis, between finished products on one hand and raw products on the other.

The Bureau of Statistics of the Department of Labor, in its report for May, shows that commodity prices during that month declined 1.9 per cent, leaving the index number 44½ per cent below the bureau's peak price in May a year ago, but still 51 per cent above the 1913 average. Foodstuffs, with a decline of 53½ per cent from the peak showed the greatest drop, and fuel and lighting materials, with a downward movement of 17½ per cent, showed the firmest resistance to decline.

Freight Rates and Business

The abrupt declines that the prices of farm and other products have suffered have brought freight rates under sharp criticism. Senator Capper of Kansas recently stated that "these rates almost absorb the farmer's grain, also a large proportion of his livestock; they have absorbed the decrease in the price of lumber; they have helped in many ways to demoralize the business of the country and to prevent its recuperation."

Freely granting that the position of the agriculturist has been an unhappy one in the past few months, it seems to us that freight rates are not guilty, as charged. The causes of commercial depression are worldwide and are not to be found in domestic transportation charges. When business was good last Fall the largest tonnage in the history of the country was offered the railroads, despite the advanced rates which became effective August 26th. Today ocean tonnage rates are at the lowest levels in a great many years, but ocean traffic is suffering perhaps even greater stagnation than rail traffic. There are many commodities that would not move even if the roads offered to carry them free for the simple reason that no market exists for them.

Bank of America Sees Big Future for U. S. in Indian Markets

If American exporters are willing to fight for the new market in India which they developed during the war they have a good chance of keeping it. This is the opinion of R. Stuyvesant Pierrepont, director of the Bank of America, who has just returned from a several months' tour of India in the course of which he made an investigation for the foreign department of the bank.

Conditions for imports from the United States will grow increasingly favorable during the coming years, as exchange differences clear away. As compared with pre-war trade between United States and India, last year's proportion of India's trade was more than doubled, Mr. Pierrepont found.

Japan is the strongest immediate competitor for this new business, declares the foreign department of the Bank of America, reporting on Mr. Pierrepont's findings. In 1913-1914, 6.2 per cent of India's total trade (export and import) was with United States. In 1919-1920, this proportion was increased to 13.8 per cent. In the pre-war year, 6.4 per cent of India's trade was with Japan, while in 1919-1920, this percentage had increased to 12.3. The United Kingdom's share of India's trade in the same years decreased from 40.7 to 37.7 and that of the whole British Empire from 52 to 51 per cent.

Last year, however, the Japanese lost out in the race, owing to the business collapse in that country. The value of all trade between India and Japan increased only 5 per cent from 1918-1919 to 1919-1920, while Japan's share decreased from 14.9 per cent to 12.3 per cent. The United States, on the other hand, increased its exports to India by 56 per cent in that year and its imports from India by 48 per cent, its share increasing from 11.7 to 13.8 per cent.

Many Indian business men feel that American competition with England for India's trade would be very beneficial, says Mr. Pierrepont, in explaining the significance of these figures. They feel that a growing proportion of trade with countries other than the British Empire would force an acceleration of India's development. American manufacturers hold many potential advantages over other non-British competitors, the main ones being the absence of language barriers, the appreciation of America's part in the war, and the favorable attitude towards the value and serviceability of American products.

Iron and steel, mineral oil, automobiles and cycles and machinery and mill-work were the principal products which made up the 428 per cent increase in value of American exports from the pre-war year to last year. Other products in which India's imports from the United States were markedly increased were electrical instruments, railroad equipment, rubber products (chiefly tires), hardware and condensed milk. It is in these fields that American manufacturers can improve their position, declares the Bank of America, if they fight hard and intelligently for the trade. Any attempt in the fields of glass and glassware, silk products and matches, will be met by very powerful and almost secure competition from Japan.

Demand for foreign iron and steel will increase, in spite of the fact that India is developing its own iron and steel industry, Mr. Pierrepont predicts. Such Indian industries as the great Tata steel mills are showing powerful and able enterprise, yet the need for iron and steel will grow beyond their capacity because the use of steel always multiplies the demand for it.

American automobiles are in a particularly favorable position. The nature of the roads, as Mr. Pierrepont observed them, allows American cars to prove their superiority and the Indian buyers appreciate the fact.

While present business conditions are depressed in India, as in all other countries, her large exports which are usually in excess of imports should promptly restore her purchasing power.

Industrial Advertising Conference Proposed

While industrial advertisers were conspicuous by their absence at the recent Atlanta convention of the Associated Advertising Clubs, those who did attend made the trip worth while by launching a well-defined movement to put industrial advertising "on the map" in future conventions.

The Engineering Advertisers' Association of Chicago and the Technical Publicity Association of New York form the nucleus of the movement which all industrial advertising interests will be invited to join. Keith J. Evans, president of the E. A. A. and W. A. Wolfe, president of the T. P. A. are planning to call special meetings in the near future to take official action on the ideas developed in Atlanta.

It was the unanimous opinion of those present at the meeting, which was held immediately after the departmental session of the Associated Business Papers, that more attention should be given to industrial advertising and that definite plans should be made to put on an attractive program in Milwaukee in 1922. It was pointed out that many advertising managers of industrial plants are kept away from the conventions because the programs do not contain sufficient features of direct interest to their business to justify the expense. Many of these men are located in small towns and cities where there are few, of any, others with similar problems. Hence they do not have the advantage of meeting fellow-workers in local advertising clubs. Even where such clubs exist, the majority of the members are interested only in retail advertising and other problems pertaining to the individual consumer.

Intercourse Needed

In many cases, very large manufacturers of industrial products have only a small sales force due to the fact that their product is sold in large units to a highly specialized type of buyers. The advertising manager has a lonesome job indeed. He needs the inspiration and information that may be obtained from an advertising convention far more than the man who is constantly exchanging ideas with a large sales organization.

The importance of promoting the movement of goods from industry to industry and the wide field for industrial advertising were discussed at length in the last *Industrial Letter*. Advertising agencies are showing a keen interest in industrial business and will doubtless give their full support to the conference idea.

Foreign Air Services Well Patronized

Partly no doubt as a result of the railway restrictions, partly because of the reduced fares now charged and partly by reason of the favorable weather conditions that have recently prevailed, the London-continental air services during the month were well patronized, to the great gratification of all connected with them. Under the conditions imposed by the limitations of the sum available for distribution as government subsidy, the British firms engaged on the service, Handley Page and the Instone Air Line, are restricted to running one machine three times a week. As a consequence of this restriction as many as forty applicants for seats have recently had to be turned away in one week. It is presumed that the majority of these prospective passengers found accommodations in one or other of the foreign-owned machines engaged on the route, which machines are not in any way hampered by their subsidy conditions as to the number of trips per week.

The terminal aerodrome near Croydon from and at which the continental machines start and arrive and the aerodrome at Le Bourget on the other side are situated at a good distance from London and Paris respectively. The journeys to and from aerodromes form part of the aerial service and are made by motor car. From the point of view of saving time there can be no doubt that the terminal services are at present responsible for the chief delay and that the full benefit of aerial travel in the matter of speed will not be realized until the conveyance by motor at the start and end of the journey is eliminated. In this connection the tests, continued during the month, with the Vickers Viking amphibian machine have clearly shown that the Seine and the Thames can be readily utilized for alighting purposes and that passengers can be picked up and deposited actually in the centers of the cities.

The Uses of Stainless Steel

In the popular mind, stainless steel is almost exclusively associated with the manufacture of table knives, and in spite of the extra cost of such implements and a common impression that they do not retain their cutting edge so long as do knives of the ordinary pattern, there seems little doubt that so far as table knife makers have provided the largest and most consistent outlet for the material. For some time past, we understand, a Sheffield (England) firm has been using stainless steel for the manufacture of forks and spoons, and, if report is to be trusted, it would appear that a considerable extension is likely soon to be made in this additional employment of the substance for domestic purposes.

During the war, as is well known, stainless steel was placed under control in order that all the available output might be directed toward the aeroplane industry, wherein it was in particular demand, or was particularly specified, for the manufacture of aero-engine valves. To what extent and for what purposes is the material now being used? In order to elucidate the matter, we recently addressed inquiries to a large number of engineering and other firms, and from the replies received we have compiled the following analysis.

In passing, it may perhaps be noted that stainless steel is distinguished by its high chromium content, and was originally discovered two or three years before the war at the works of Thomas Firth and Sons, Limited, of Sheffield, England. The firm was seeking by a series of experiments with various alloy steels to discover one that would resist the erosive action of the gases in the chambers of gun tubes. The experiments did not result, in the firm's opinion, in any material success being registered in the direction in view, but, as has frequently happened before, discovery was made along other lines than those directly planned. One of the alloys experimented with was found to have a remarkable resistance to rusting and staining, and was ultimately placed on the market under the now universally known name of "Stainless Steel." A typical analysis of the material is as follows:

	Per Cent
Carbon	0.25-0.35
Silicon	0.1 -0.5
Manganese	0.2 -0.4
Chromium	12-14

The replies received to our inquiries indicate that many firms which would have thought likely to find stainless steel useful in some portions of their products are not using it at present, nor have its immediate use in contemplation. The remaining replies divide themselves into two classes, namely, those from firms which have tried stainless steel, but which have not adopted it for various reasons, and those firms which are today successfully using it. With the latter class may be included the replies received from certain firms which, having experimented with the material, having found it generally suitable for their purpose, and which are about to adopt or are seriously considering adopting it as standard. From both these categories much of value is, we think, to be learned.

Stainless steel has been put to many uses. Among the products in which the steel has been tried, though not always satisfactory, are the following: Pipes, springs, motor cars, locomotives, pump shafts, pistons and piston rings, gas engines, bicycles, airplanes, surgical instruments and optical appliances.

Increased Activity in Manufacturing

It is announced that the Steel Company of Canada, Hamilton, Ont., Canada, will begin to operate its plant eight hours a day for four days a week after a long shut down.

Some departments of the Canadian Westinghouse plant at Hamilton, Ont., Canada, are being increased from four to five days per week.

The Hercules Powder Co., Wilmington, Del., has purchased the Aetna Explosive Co., Inc., of New York, by which it acquires a number of additional plants. These will include a plant for the manufacture of regular blasting caps and of electrical blasting caps, at Port Ewen, N. Y.

The Baxter D. Whitney & Son Co., Inc., Winchendon, Mass., builder of woodworking machinery, which has been operating three days a week for some time has increased the schedule to four days a week. The company is employing about 200 hands at present.

Improved Finances of Detroit Auto Builders

The affairs of the McCord Manufacturing Co., which has its main plant in Dtroit, it was learned are gradually on the mend, also that the cash balance of the company is now well over half a million dollars, and that it has successfully disposed of a large amount of automobile radiators into which it had put copper costing twenty-four cents a pound.

The latter achievement is typical of some of the things which the Creditors' Committee has accomplished since it took over the management of the business early in February. At that time cash balances aggregated less than $100,000 and current assets were less than current liabilities.

The banker from whom this information was obtained pointed out how saving the McCord company from bankruptcy had also saved about thirty smaller concerns dependent on it for business. Eight or ten similar cases had come to his attention. He noted instances in his bank within ten days where whole lines of credit had been retired with one payment, one of $300,000 being a particular one. Some of the larger companies, Hupp, Hudson and Federal Truck, he stated, had reduced their current bank indebtedness to nominal amounts.

There is a growing feeling that things have begun to mend and that the motor industry as a whole has definitely passed its crisis. George H. Kirschner, president of the First State Bank, whose institution handles much of the retail business of the city, notes a similarly recuperative trend among the storekeepers.

Detroit, with its great manufacturing industries is a good barometer for reading the slow but sure improvement of business.

Jugoslavia Buys Locomotives from Germany

Recent information is to the effect that the Ministry of Communication of Jugoslavia has made a contract with a German firm for the purchase of five new locomotive engines of standard-gage type. The price to be paid is unknown, but it is believed to be very low, particularly owing to the favorable exchange rate. This is the first contract made by Jugoslavia with a German firm for the purchase of railway material.

Bureau of Information at Washington

The following notice has been issued from Washington over the official signature of Postmaster General Will H. Hays.

"It is the wish of the President that visitors to the seat of Government shall have every opportunity to get full information concerning all governmental departments. It is especially his desire that all those who come to Washington to transact business with any department or bureau of the Government may quickly be advised as to the exact location and means of reaching the particular department or bureau in which may be centered the business which they desire to transact.

"For this purpose there has been established a Bureau of Information on the ground floor of the Post Office Department Building, located on Pennsylvania Avenue at Twelfth Street, which is in charge of competent people who will definitely answer queries of this character.

"The public is advised of this arrangement and invited to make use of the facility."

Steel Company Opposes Metric System

Representative Henry W. Temple, of Pennsylvania, has laid before the House a petition of the Elliot-Blair Steel Co., New Castle, Pa., protesting against the Britten compulsory metric system bill. The petition has been sent to the House Committee on coinage, weights and measures, which also has the Britten bill.

Endorses Metric Bill

An unqualified endorsement of the metric system bill introduced at the last session by Senator Frelinghuysen has been voted by the board of directors of the Associated General Contractors.

Washington Notes

By Paul Wooton

Washington Correspondent

Erroneous conclusions are likely to be drawn by the general public as to the meaning of the experiments which have been conducted by the Navy off Hampton Roads. The capital ship is not in the balance. Airplanes did nothing that they have not done many times before. The experiments were of importance in testing material, but they were of far greater significance in that they afforded an opportunity for the technical men in the Navy and in the Army to observe the experiments and to take account of the progress being made in the development of the art of destruction. It was the consensus of opinion among them that the World War has so increased the possibilitiek of visiting upon non-combatants, as well as combatants, all of the old terrors and many new ones, that the very frightfulness of it is likely to be the most potent factor in promoting efforts to limit the possibility of war.

The airplane, chemical warfare and other new auxiliaries are contributing importantly in making war more terrible, but it was pointed out many times by observers at the Hampton Roads tests that these agencies have not been fundamentally revolutionary in character.

The tests off Virginia capes contribute nothing to the controversy as to whether or not capital ships had best be superceded by a larger number of smaller craft. The experts seem very generally of the opinion that the capital ship is as necessary as ever. The fact that airplanes demonstrated incontrovetibly that they can successfully bomb a target no larger than a submarine strengthens the view that the development of aviation will make necessary some changes in general naval practice, but serves to increase the usefulness of battleships. With the increased efficiency of bombs and with the development of the use of gas in such bombs a greater independence for the fleet is foreseen. Within the next few years the offensive ability of the airplane will have reached a point, it is believed, where it can be relied upon largely for defense of the sea within 200 miles of the coast. No fleet would be able to carry enough airplanes to protect itself from the swarms of such craft which could fly out to meet it once that it neared the shore of a hostile country. Under past conditions our fleet would be handicapped in case of war by the necessity of dividing up to protect a long coast line. The fleet would be precluded from getting together and proceeding to sea to meet the oncoming enemy fleet for fear that the enemy might avoid a conflict at sea, slip around and raid the coast. With the coast able to take care of itself with its airplane and land defenses, the effectiveness of the fleet is multiplied. The day probably never will come when the large-caliber gun will not be a great asset, so that the battleship is likely to become larger and larger.

Sinking of the "U-117"

The progress being made in aviation was brought out with particular vividness at the test on Tuesday. The rusty "U-117" had been anchored 70 miles east of the Cape Charles light. The naval bombers flew from their base at Yorktown more than a hundred miles from their target. Precisely at the time announced the three big bombers soared up out of the horizon and made straight for the tiny, tossing target. Each of the three planes dropped a bomb as it passed over the submarine. This first attempt showed that great accuracy is possible as each of the three great jets of water which followed the explosions of the bombs, was so close as to drench the whalelike back of the former German terror. The big planes turned quickly into a circle and rushed back over the target which lay bobbing 1,200 ft. below. This time each plane dropped its remaining three bombs—nine in all. The spectacle which followed never will be forgotten by observers aboard the "Henderson." The bombs looking like plummets because of the distance, dropped swiftly and gracefully. Then came a mighty upheaval on the placid bosom of the ocean. A great pile of water was lifted skyward. It looked like some giant architectural pile. It was not dissimilar in form from the Woolworth Building. The base was shot through with the fire from the two bombs which made direct hits and were detonated by actual contact with the submarine. From these same bombs came black smoke which was streaked through the glistening white of the countless tons of water which had been hurled hundreds of feet upward as spray. When the great tower of water sank slowly into the ocean again the observers were surprised that a vestige of the submarine was left, but as the water quieted down it was seen that the stern was rising. It rose slowly and then as if its machinery had dropped to the bow, the stern reared high and quivering, shot beneath the surface to its last resting place in an American sea.

The "Pennsylvania"

A striking feature of the trip, to those who do not follow naval matters closely, was the improvements which have been made in recent years in the equipment of battleships. After the tests ample time was given to inspect the "Pennsylvania" and several other of the more recent additions to the Atlantic fleet. Anchored far from shore with no prospect of a rush of visitors, a chance was given the higher officers to take all the time that was necessary for careful explanations of the mechanism and the practice aboard these ships. They took advantage of the opportunity to explain the full significance of the developments in construction and equipment. The public can in no way visualize what remarkable machines battleships have become, nor does it realize that no month passes without some improvements having been devised. Not infrequently several improvements are devised within the span of a single month. The great development of recent years is the adoption of oil as fuel. This greatly increases the space available for purposes other than bunkering fuel. Most of the time formerly lost in the cumbersome task of coaling now is saved and the additional space is used to great advantage. Another revolutionary change is the resort to electricity for propulsion, and practically every other duty which power is called upon to perform. These ponderous floating forts are steered as well as driven by electricity. A touch of the finger on the controller is all that is necessary to throw the rudder all the way over. Four wheels, providing places for ten men, are required to move the rudder ten points over by hand when the ship is in motion. A greater deflection of the rudder can not be attained without the use of mechanical power. Cooking is done by electricity and that agency is employed to a surprising extent in a large number of activities.

Fire Control

Perhaps the greatest improvements in recent years are in range finding and fire control. Inter-communication on ship board is an exact science. The main telephone switchboard is larger than in many towns. In addition there are signals of several sorts and speaking tubes. The peculiar thing about these tubes, which are sticking around everywhere is that you really can hear through them. The radio has eliminated the greatest obstacle of naval navigation—isolation from bases of information.

The coming of the submarine has brought great improvement to searchlights and to lookout facilities while the introduction of the airplane has added the anti-aircraft guns to the upper decks. The increased range of guns and the airplane bomber now make necessary the adoption of a protective deck of heavy armor to guard against shots of high trajectory and the bombs that may be hurled down. Even now thought is being given to an adaptation of the gas mask to be placed over ventilators so that poison gases may be filtered out if the ship should be hit by a gas shell or a gas bomb.

Another development is the water-tight integrity of the ship. It would take four torpedoes doing the average damage of a direct hit to sink the "Pennsylvania."

Saving Fuel in the Industries

The industrial Section of the Super Power Survey has completed the collection of data on the power consumed by the various industries within the Super Power Zone and has made an estimate on the amount of fuel that could be saved by the application of the Super Power System to those industries.

The labor of gathering the large amount of information necessary has been great, but will be more than paid for if the power users will profit by what they can learn from the resultant data.

The data will eventually be published by the Census Bureau, but as the date of publication will be in the somewhat distant future, the *American Machinist* has arranged with Harold Goodwin, Jr., Assistant Engineer, Super Power Survey, for an early release of such part of the data as relates to iron manufacture.

Conditions in the French Iron and Steel Industry

The French pig-iron production during 1920 is reported by the Comité des Forges de France to have been 3,433,791 metric tons, 3,374,135 metric tons of which were produced in blast furnaces and 59,656 metric tons in electric furnaces.

The above figures show an increase of 42.3 per cent over the production for 1919, which amounted to 2,412,149 metric tons.

The situation in blast furnaces was progressively improved during the first part of the year, owing to more normal conditions of the railroads. The Spa protocol of July 16, 1920, placing on Germany the obligation of delivering 2,000,000 tons of coal per month to the Entente has increased the amount of coal available for the French metallurgical industry.

The monthly production of pig iron shows an almost steady increase during the year, with the exception of the months of March and April. It reached a climax in October and remained practically unchanged during the last quarter of the year.

In the works of Meurthe-et-Moselle the number of furnaces blown in was augmented from 21 to 33, and the increased coke supplies gave new activity to the works of Lorraine and permitted the blowing in of furnaces which had to be blown out during 1919.

On the other hand, furnaces in the center and south of France which had been active throughout the war, and were blown out owing to the unfavorable conditions in 1919, have remained inactive. There were 93 blast furnaces in operation on January 1, 1921, as compared with 82 on July 1, 1920, and 69 on January 1, 1920.

Hematite and special pig-iron production is practically the same. Production of phosphorous pig iron shows an increase from 1,905,000 metric tons to 2,931,000 metric tons. This is due to the increased production in two basins producing that kind of pig iron, the Basin of the East Lorraine.

Cast iron production represents 23.6 per cent of the total production of hematite and phosphorous pig iron in 1920; Thomas pig iron, 63 per cent; refined pig iron, 8.9 per cent; Bessemer pig iron, 1.8 per cent; and ordinary pig iron, 2.7 per cent.

In 1919 Thomas pig iron production reached 58 per cent of the total production, while refined pig iron and cast iron came in for 12.5 per cent and 21.5 per cent, respectively.

The total production of steel in France during 1920 is given as 3,050,396 metric tons, 2,951,636 metric tons of which were ingots, and 98,760 metric tons of which were castings, according to the Comité des Forges de France, Paris.

The production for the past year is 67.2 per cent of the pre-war production and represents an increase of 39 per cent over the 1919 production, which amounted to 2,186,260 metric tons. The increase bears mostly on castings, the production of which shows an increase of 66 per cent over 1919, during which year 59,525 metric tons of castings were produced. Works which were not affected by the invasion of northern France turned out 80 per cent of the 1913 production.. Those of recovered Lorraine only produced 49 per cent of the pre-war amount.

During the first part of the year the situation was not considered very satisfactory on account of lack of adequate transportation. However, during May and June traffic on the railroads was practically normal. The difficulty in securing adequate coal supplies also impaired the production.

The prices quoted for coal were constantly increasing. Coal from the north of France which was being paid for at the mine at the rate of 110 francs per ton in January, 1920, increased to 195 francs in May, whereas the same quality of German coal increased from 150 francs to 225 francs; American coal from 320 francs to 440 francs; English coal from 280 francs to 450 francs. Under such conditions long-term deliveries could only be contracted for, and orders accepted at the prevailing prices at the time of completion.

During the latter part of the year the situation improved. There were 1,846,000 metric tons of steel produced during that period, as compared with 1,204,000 metric tons during the first six months of the year. As a result of the Spa Protocol, deliveries of German coal were increased and old orders could be executed. However, at that time the first effects of the world-wide economic crisis were beginning to be felt, as a result of the high prices quoted for raw material and coal, the difficulty of obtaining banking credits, higher freight rates on the railroads, and the decrease in funds available for the reconstruction of devastated regions.

Julius Klein, Latin-American Authority, to Head Foreign Trade Bureau

Engineering and foreign trade go hand in hand in the opinion of Julius Klein, who recently was confirmed by the Senate to be director of the Bureau of Foreign and Domestic Commerce of the Department of Commerce. Exploitation of natural resources, the extension of railroads, the building up of highway systems, the establishment of new enterprises and the expansion of manufacturing industries are a few of the engineering activities which Mr. Klein cites as having a close relationship with the building up of trade abroad.

While Mr. Klein is known better as a Latin-American specialist, he has also traveled widely in Europe for the express purpose of studying trade conditions there.

While it is going to be generations before Latin-America undertakes manufacturing in a highly intensified way, Mr. Klein points out that there is a steady tendency to develop native industries which in the aggregate calls for a large amount of machinery and supplies. It is well within the range of possibility for American contractors and American manufacturers to secure a large portion of the business resulting from this development, Mr. Klein believes. In order to make this possible it is not only necessary to get American engineers on the ground and to stimulate this activity with American money, but it also is necessary to acquaint Latin-American engineers with American methods and American products. He knows of no better plan than in inducing graduate engineers to come to the United States for post graduate work. In many instances, he believes, it would pay private companies interested in a business way in Latin-America to arrange at their own expense such post graduate courses for these young men, after a year in our technical schools, interspersed with visits to our factories and industrial establishments, these engineers will return to their own countries imbued with American practice and familiar with American machinery and materials. As the judgment of one of these engineers is likely to be followed to an increasing extent as he grows in his profession, the United States and its industries will benefit by this special knowledge which was made possible during his post graduate experience in the United States.

The development of the petroleum industry in Latin-America is largely an engineering activity and will result, Mr. Klein points out, in an increasing demand for American made oil well supplies. Another great opportunity offered American industries is the certainty of great increases in the railroad mileage in South America. Some of the lines under contemplation will be of the greatest commercial importance to the United States. For instance the completion of the railroad from Salta in Argentina to Antofogasta in Chile—a line 400 miles long across the Andes from northern Argentina to northern Chile—brings New York and other east coast ports of the United States the equivalent of many days nearer Buenos Aires. A plumb line dropped from New York falls exactly along the west coast of South America. The advantages of reaching Argentine markets by this route is not alone one of distance as navigating conditions are very much more advantageous on the west coast of South America.

Another great South American project to which American engineering skill well might be applied and which will result in numerous trade advantages is the development of hydro-electric power in the Cordivan Hills of Argentina. This constitutes one of the most promising power prospects in the world, Mr. Klein believes. Argentina must look to these same hills for its supplies of stone for road building purposes. The stone of that locality is particularly adapted to use in road construction and is one of the few places in the southern republic where such a supply can be obtained. Highway building throughout South America has been delayed very greatly but the point has been reached where very great development in that respect must come.

Irrigation and reclamation are other engineering fields in which great activity may be expected throughout Latin America in the future. In each case there will be demand for American brains and American equipment.

In all of these enterprises Mr. Klein emphasizes the necessity for American engineers, manufacturers and merchants to keep in mind that Latin-American countries are governed by young men. Not only do young men have the deciding voice in public works but they are the active administrative officials in private enterprise. It is for that reason that he thinks we well may cultivate in every proper manner the favor of the Latin-American student.

Mr. Klein was born in San Jose, California. His early education was obtained in the public schools of that city. Later he attended the University of California for six years where he specialized in economics. During that time he also investigated the possibilities of manufacturing development on the Pacific Coast for the Carnegie Institution.

In 1909 he went to Harvard, where he concentrated his attention on the study of economic affairs in Latin-America and its industrial history.

From 1912 to 1914 Mr. Klein was in Europe studying the trade situation in various countries. Later he traveled extensively in South America. These trips were the basis for a number of courses of lectures delivered at Harvard.

During the war, Mr. Klein was called to Washington to take charge of the Latin-American Division of the Bureau of Foreign and Domestic Commerce. At that time it was particularly necessary to have in that position a man thoroughly familiar with the raw material situation in South America with the attendant problems of ship allocation and the prevention of unnecessarily troublesome curtailment of shipments on which Latin-America was dependent upon the United States.

In 1919 and 1920 Mr. Klein was the commercial attaché of the United States at Beunos Aires. During that time he spent considerable time in Chile, Paraguay and Uruguay.

Since his return from Buenos Aires he has spent most of his time speaking before chambers of commerce and other civic and trade organizations on the possibilities of extending our trade to Latin-America.

Standardization to Eliminate Waste

The subject of standardization of manufactured products as a means of promoting efficiency and eliminating waste was proposed by the American delegation as a question for discussion at the first annual meeting of the International Chamber of Commerce in London this month. Standardization is strongly urged.

The American Committee says, "In the lack of standards and excessive variety in production of commodities is found to be the prime cause of stagnant stocks of commodities and congestion in distribution.

"The efforts of the United States government with the co-operation of industry in reducing this variety during the war gave evidence of the practicability of such an undertaking and the benefits to industry. Standardization in the United States as referred to in the report is at present confined to private initiative except as the work of engineering societies and the Bureau of Standards of the federal government maintained by the United States.

"Efforts are now being made to co-ordinate this work, at least to bring about the adoption of agreed upon standards. The standardization of fabricated products through elimination of excess variety, is still being considered by certain industries, aided by their commercial organizations. It is also being considered by the Fabricated Production Department of the Chamber of Commerce of the United States. There is much opportunity in the proper treatment of this subject to promote greater efficiency in production and to eliminate duplication and waste."

Air Service in Reval With Ten Machines

Consul Charles H. Albrecht, of Reval, Esthonia, reports that a company has been formed in that country for the purpose of organizing airplane service from Reval. The basic capital of the company is 10,000,000 Esthonian marks (at present the rate of exchange equal to about $33,333). Among its founders are Martin Luther, head of a large woodworking factory, and Otto Strandman, president of the National Assembly.

The company plans to have service organized by summer, with 10 airplanes on the following routes: Reval-Helsingfors, Reval-Stockholm, Reval-Narva-Petrograd, Reval-Dorpat-Walk-Riga. Negotiations are said to have been started by the company for connecting its proposed routes with those of other European air services.

Business Items

The Brown Instrument Co., of Philadelphia, Pa., manufacturer of instruments for indicating and recording temperatures, pressures, speeds, operations and drafts, has opened a branch office in Cleveland, 201 Reliance Bank Building, 1634 Euclid Ave., to render the customers in the Cleveland district service in every way possible. This makes a total of eleven district offices located in New York, Pittsburgh, Detroit, Cleveland, Chicago, St. Louis, Denver, Los Angeles, San Francisco, and Montreal.

The North Shore Machine Co., of Lynn, Mass., has recently been organized and incorporated with a capital stock of $12,000 to engage in the general machinist business. The officers are L. A. Porter, Lynn, president; Eugene R. Dennert, Cedar Heights, Lynn, treasurer. These men, together with G. A. Porter, form the board of directors.

The Industrial Lock-Nut Co., of Worcester, Mass., has recently been organized and incorporated with a capital stock of $250,000 to engage in the manufacture of lock-nuts, etc. N. R. Thibert, of Worcester, is president; George P. Newton, Worcester, treasurer; and Mr. Thibert and Mr. Newton, with E. P. Cotton, of Worcester, are the directors.

The Stafford Company, of Readville, a suburb of Boston, Mass., manufacturer of weaving and textile machinery, etc., has recently been incorporated with a capital stock of $1,500,000. The directorate consists of president, Clifford H. Walker; treasurer, Joseph R. Watkins and Allison G. Catheron.

The Bridgeport Motor Truck Corporation, of Bridgeport, Conn., has recently been incorporated under the laws of the State of Delaware, with a capital stock of $1,200,000, to take over the stock and plant in Stratford, Conn., a suburb of Bridgeport, of the Bridgeport Motor Truck Co., which some time ago went into the hands of a receiver. The concern manufactures the "Bridgeport" motor truck. The new company plans to increase production at an early date.

The Baker-Payne-Voye Co., of Boston, Mass., has just been incorporated under the laws of Massachusetts, to deal in steel and iron products, etc. The capital stock is $50,000. The board of directors is made up of the president, Vernon J. Voye, of Milton, Mass.; treasurer, Frederick W. Baker, Milton, Mass., and H. J. Payne, of Revere, Mass.

The T. L. Harkins Machine Co., 44-54 Farnsworth St., Boston, Mass., manufacturing and contracting machinists and manufacturers of special machinery and tools, is completing the construction of a fireproof factory building in Allston, a part of Boston. The structure is a two-story 50 x 100 ft. building.

The Cook-Taylor Co., Inc., Fall River, Mass., has just been organized and incorporated with a capital stock of $50,000 to engage in the manufacture of textile machinery, gages, etc. The directors are Albert Cook, president; Edward F. Cook, treasurer, and Ralph E. Taylor.

Lunt-Moss Corporation, of 45 South Market St., Boston, with a factory in Wakefield, Mass., has been incorporated recently under the laws of Massachusetts, with a capital stock of $50,000. The company will manufacture tools, machinery, etc. James W. Moss, Boston, is president and together with Bejamin F. Levy and L. H. White, of Boston, forms the board of directors.

The American Valve and Tank Co., of Delaware, will erect a plant in Indianapolis, Ind., and production is hoped for within three months.

A. H. Petersen Manufacturing Co., Milwaukee, Wis., has discontinued its tool and die manufacturing and will turn over its entire plant to the manufacture of the "Hole Shooter" portable electric drills and other automotive devices.

John Wilson, head of the National Steel Construction Co., has established in the corporation's Duwamish Waterway plant the first range boiler factory west of the Rocky Mountains and is now giving steady employment to an increasing force of men. Heretofore Seattle and other Pacific Coast centers have had to draw on the East and Middle West for range boilers. The new factory has a capacity of 80 range boilers a day. They are built especially for the

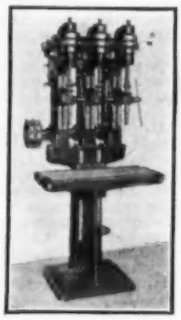
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Drilling Machine, Sensitive, No. 1B

Edlund Machinery Co., Inc., Cortland, N. Y.

"American Machinist," March 31, 1921

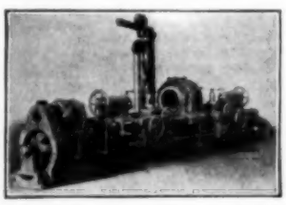


The machine is furnished in combinations of from one to four spindles. Power is transmitted from the drive pulley through two bevel gears and a vertical shaft to the rear three-step cone pulley, from which it is carried by belt to the cone on the spindle. The gears are pack-hardened and are lubricated by the splash system. The machine is equipped throughout with ball bearings. Face of column to center of spindle, 7 in. Maximum distance, spindle nose to table, 30 in. Largest drill machine will drive effectively, ¾ in. Weight, 430 to 1,115 lb., according to number of spindles.

Lathe, Axle, Double, Heavy-Duty, Putnam

Manning, Maxwell & Moore, Inc., 119 West 40th St., New York, N. Y.

"American Machinist," March 31, 1921

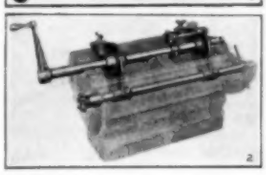


The machine is built with two tailstocks and a central driving head, the driving head being driven by means of a broad-faced herringbone gear and pinion running in an oil bath. Both tailstocks are adjustable along the bed by means of racks and pinions. Four speeds are obtainable through a gear box and these speeds may be supplemented by the use of a variable-speed motor. A 1-ton quick-acting crane can be supplied with the machine. The machine weighs, with crane, 18,900 lb. Weight boxed for export, 22,950 lb., made up in three boxes totalling approximately 375 cu.ft.

Babbitting and Boring Outfit, (Re-), Gas-Engine Bearing

Detroit Garage Equipment Co., 268 Jefferson Ave., Detroit, Mich.

"American Machinist," March 31, 1921



The outfit consists of equipment for rebabbitting and reboring the main crank-shaft bearings of automobile motors and gas engines, there being a different outfit for each style of motor. The rebabbitting bar shown in Fig. 1 is supported and aligned in the motor block by frames that are located by pins from the holes in the crankcase flange. Babbit-retaining collars are held against the ends of the bearings by compression springs. A two-quart combination blowtorch and melting pot is included. The reboring bar is located by means of a line bar placed through the camshaft holes, as shown in Fig. 2. A feed screw is provided, being operated by a pin in the boring bar turning the star wheel.

Gage, Ring, Master

John Bath & Co., 8 Grafton St., Worcester, Mass.

"American Machinist," March 31, 1921

The gage is made narrow so that surface depressions in the piece being gaged can be more readily detected. Its outside diameter is unusually large to provide for rigidity, and its surface is perforated with a series of concentric holes to lessen the weight, and also to provide for air circulation so that it will more quickly return to room temperature after it has been heated or cooled.

Chain Block, Spur Geared, "G. B."

André, Weill & Co., 149 Broadway, New York, N. Y.

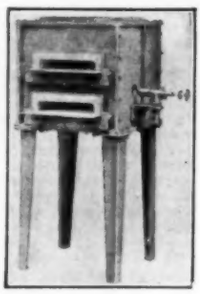
"American Machinist," March 31, 1921

The device is made entirely of drop-forged steel and the chains are electrically welded. The load sheave is accurately machined to fit the chain links and each block is fitted with two chain guides so hinged that the hoisting chain can be pulled from any angle without interference. The blocks are made in fourteen sizes with lifting capacity of from ½ to 20 metric tons (2,205 lb.), and weighing from 62 to 1,036 lb. The pull on the hand chain required to lift the rated load varies from 61 to 127 lb.

Furnace Forging, High Speed, with Preheating Oven

Bellevue Industrial Furnace Co., Detroit, Mich.

"American Machinist," March 31, 1921

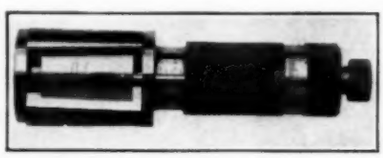


The furnace is especially intended for use in forging such work as high-speed-steel drills and reamers, and is provided with a preheating chamber in which the work can be slowly brought up to a heat before inserting it into the high-temperature chamber. The preheating oven is heated by the gases from the high-temperature chamber. Either oil or gas can be used for fuel. The furnace is built in three sizes, to suit various jobs.

Gage, Micrometer, Plug, Internal

John Bath & Co., 8 Grafton St., Worcester, Mass.

"American Machinist," March 31, 1921



The gage is provided with four jaws fitted to inclined dovetail grooves in the body, and movement of the jaws is controlled by a micrometer screw. The inclination of the grooves is such that the amount of lateral movement of the jaws in relation to cnanges in diameter of the gage is 5 to 1. The divisions on the body of the plug each represent a change in diameter of 0.010 in., while the graduations on the collar each represent a like change of 0.0001 in. In measuring the diameter of a hole it is only necessary to collapse the jaws of the gage sufficiently to enter it, and to then expand them until contact is secured, when the size can be read from the graduated collar.

Boring Outfit, Ford Cylinder

Detroit Garage Equipment Co., Detroit, Mich.

"American Machinist," March 31, 1921

The complete outfit is intended for use on and has all necessary tools for reboring and burnishing the cylinders of Fordson and Ford model "T" motors. The jig is intended for use beneath any upright drill of adequate capacity. It consists of a heavy iron casting carrying a boring bar. The cylinder is located from the crankshaft flange and is clamped down by T-bolts. The boring bar and burnishing tool are both provided with floating shanks. The burnishing tool is shown standing on the left end of the jig. In operating this tool, the power feed is not necessary as the rollers feed the tool automatically.

Clip, paste on 3 x 5-in. cards and file as desired

high pressure of the city water systems of the Coast.

The John Hill Foundry Supply Co. and the Hill & Griffith Co., Cincinnati, Ohio, were consolidated July 1, under the firm name of the Hill & Griffith Co. John Hill, one of the founders of the Hill & Griffith Co. and one of its officers for many years will be president and general manager and William Oberhelman will be vice-president and manager of the southern district with headquarters at Birmingham, Ala.

The Chapman Valve Manufacturing Co., Indian Orchard, Mass., is to insure its employes against death, sickness or accident while at work. Life policies will range from $500 to $1,000, depending on the length of employment, while $12.50 a week will be paid in case of sickness or accident.

The capitalization of James Cunningham Son & Co., Rochester, N. Y., has been increased from $1,200,000 to $3,200,000. The company is engaged in the manufacture of automobiles. The increased capitalization is intended to take care of extension in the concern's business. The certificate was signed by Augustine J. Cunningham, president and Francis E. Cunningham, secretary. The capital will be divided into $1,200,000 in common stock and $2,000,000 in preferred stock.

The directors of Chicago Pneumatic Tool Co., New York, N. Y., have declared a quarterly dividend of 1 per cent, payable July 25, to stock of record July 15. Quarterly distributions of 2 per cent have been made on this issue for some time. After the meeting the following statement was issued: "Although business has been greatly restricted by introduction of rigid economies the company has been able to operate after liberal charges for taxes and depreciation at a small profit for the first five months of this year."

Machinery valued at $100,000 was sold at auction recently by Samuel G. Freeman & Co., of Philadelphia, at the plant of the Worthington Pump and Machinery Co., Hazelton, Pa., whose equipment is being dismantled. The works turned out munitions during the war, but have been idle since the armistice.

The American Color Process Press Co., Morrison, Del., has been incorporated with $100,000 capital, by L. Irving Handy, Julian C. Walker and M. K. Spicher, to manufacture printing presses and parts.

The Universal Machine Co., Bowling Green, Ohio, has increased its capital stock from $1,250,000 to $1,500,000.

The Pacific Can Machine Co., Los Angeles, Cal., has been incorporated with $150,000 capital, by Samuel B. Irvin, I. B. Stetson and J. E. McComas to manufacture can-making machinery.

The Stamp Electric Hoist Co., San Francisco, Cal., has been incorporated with $75,000 capital, by William T. Burney, C. S. Somers and Horace W. Lash. Monadnock building, to manufacture electrically-operated hoisting machinery, etc.

The American-La France Fire Engine Co., Elmira, N. Y., is booked five months ahead to full capacity, according to Paul Appenzellar, vice-president of the company. The company has not been affected by the general business depression, he said, shipments for the period between Jan. 1 and May 21 totaling $2,011,000, compared with $1,968,000 for the corresponding period last year.

The export office of the Foster Machine Co., the Kempsmith Manufacturing Co., and the Giddings & Lewis Machine Tool Co., which has been located at the Grand Central Palace, New York, under the supervision of L. S. Devos, was closed on June 30. This action was brought about by the decline in export market for machinery.

The Fowler Co., Worcester, Mass., has recently been incorporated to engage in the manufacture of hardware specialties, etc. The directors are T. C. Garbutt, Brookline, who is president and treasurer; and Charles B. Rugg and Henry L. Green, of Worcester, Mass.

The Peerless Manufacturing Co., of Providence, R. I., has recently been incorporated under the laws of Rhode Island, to engage in the manufacture of tools, etc. The capital stock is $300,000, and the incorporators are: Theodore Beauregard, of Providence; Leon S. Courcy, of Attleboro, Mass., and John B. Pineault, of Attleboro, Mass.

Edward Patt and Gustave Stasewick, owners of the Sheboygan (Wis.) Welding and Cutting Co., have formed the **Fond du Lac Welding and Cutting Co.** and will establish a similar business here. A building at McWilliams and Marquette Sts., has been leased. The partners will divide the management of the two shops.

Personals

James E. McKenny, who recently retired as production manager for the Republic Rubber Corp., Youngstown, O., has accepted a similar position with the Standard Spring Co., Cleveland, O. Before going to Youngstown last year he was with the National Works, Worcester, Mass., of the Wickwire Spencer Steel Corp.

W. A. Taylor, formerly Western manager for the LaBelle Iron Works, Steubenville, O., has been appointed manager of the Western offices opened by the Wheeling Steel Products Company, Wheeling, W. Va., in the Rialto Building, San Francisco.

William Weischel has been appointed manager of the Dover and New Philadelphia plants of the American Sheet and Tinplate Co. to succeed W. L. Goodhue who was district manager there for years. Mr. Goodhue recently was transferred to Farrell, Pa., where he is manager of the Mercer works, and the position of district manager has been eliminated. Mr. Weischel was associated with Mr. Goodhue at Dover for several years.

S. H. Truitt, Land Title Buliding, Philadelphia, Pa., has been made manager of the Philadelphia district sales office opened by the Bayonne Bolt and Nut Co., Bayonne, N. J. Mr. Truitt formerly was district sales manager at Philadelphia for the LaBelle Iron Works, Steubenville, O.

E. W. Burbank, district manager for the Allis-Chalmers Manufacturing Company, is now permanently located at Dallas, Texas. He was formerly in New Orleans, La.

C. G. Tolley has recently accepted a position as engineer with John T. Rowland, Jr., architect, of Jersey City, N. J. He was formerly with Arthur D. Little Co., Cambridge, Mass.

Chester C. Jackman, until recently factory manager for the Victor Saw Works, Springfield, Mass., is now vice-president and treasurer of the Dolman Manufacturing Co., Inc., Springfield, Mass.

Winfred H. Van Gorder has severed his connections as factory manager for the Automatic Ticket Selling and Cash Register Co., Inc., New York City and for the present is located in Vestal, N. Y.

F. R. Ginorio for eleven years connected with the sugar industry, working with the Cuban-American Sugar Co., has opened offices as consulting engineer, specializing in all branches of sugar-house work. He is located in Havana, Cuba.

Nixon W. Elmer has opened an office in Quincy, Mass., as consulting engineer in conveying and mechanical handling. He was formerly engineer for the Harry M. Hope Engineering Co., Boston, Mass.

William H. Okun, formerly with the construction department of the New York Central Railroad Co. and more recently production engineer of the Aws Manufacturing Co., manufacturer of brass products, of Brooklyn, N. Y., is now vice-president and works engineer of the Superior Wood and Heel Co. of Brooklyn, N. Y.

William Chambers, known affectionately in the foundry trade as "Uncle Billy," has resigned from the Garden City Sand Co., Chicago, Ill., with which he was affiliated for 25 years.

Ambrose Swasey, president of the Warner & Swasey Co., Cleveland, Ohio, has been elected to honorary membership in the American Society of Civil Engineers.

Dwight T. Farnham, formerly consulting industrial engineer of St. Louis, Mo., is now vice-president of C. E. Knoeppel & Co., Inc., of New York.

Francis M. Waters, for the past two years advertising manager of the Hendee Manufacturing Co., Inc., of Springfield, Mass., has resigned his position with that company to enter business for himself.

H. O. Peterson has recently joined the general sales department of the Gilbert & Barker Manufacturing Co., of West Springfield, Mass., and will leave soon on a sales mission in foreign fields.

Frank W. Gallagher, for the past six years field service engineer in the Chicago office of the Gilbert & Barker Manufacturing Co., of West Springfield, Mass., is now permanently located at the home plant in West Springfield. Mr. Gallagher has been with the company for the past forty-one years.

Trade Catalogs

South Bend Lathes. South Bend Lathe Works, 400 East Madison St., South Bend, Ind. A 48-page catalog describing and illustrating a complete line of lathes as manufactured by this company.

Snyder Upright Drills. J. E. Snyder & Son, Worcester, Mass.. A fifty-one page catalog describing and illustrating and also giving the dimensions of a complete line of drilling machines as manufactured by this company.

Winches and Hoists. The Silent Hoist Co., 302-4 McDougal St., Brooklyn, N. Y.. A six-page illustrated and descriptive bulletin of a complete line of power winches for mounting on motor trucks and a self-contained gasoline engine driven capstan winch for car pulling and hoisting.

Tool Service. Mehl Machine Tool and Die Co., Roselle, N. J. A twenty-three page catalog describing and illustrating jigs, dies, fixtures, gages, patterns and special machinery, as manufactured by this company.

Approved Applications. The Electric Hoist Manufactures Association, 165 Broadway, N. Y. C. A catalog describing and illustrating hoists as manufactured by this company.

Q-Alloys. General Alloys Co., 1222 So. Michigan Ave., Chicago, Ill. A sixteen-page catalog describing and illustrating heat resisting metals, known as "Q-Alloys," and their uses for retorts, carbonizing boxes cyanide lead pots, pyrometer tubes, etc.

Hauck Burners. Hauck Manufacturing Co., Philadelphia, Pa., Bulletin No. 112, describing a line of burners for foundries, boiler, machine and repair shops.

Bath Easy-Cut Taps. John Bath & Co., Inc., Worcester, Mass. Bulletin No. 15, describing a precision tap which removes metal easily and is said to produce a perfect threaded hole. Included also is a circular which gives sizes established by the National Screw Thread Commission on Taps.

Hjorth Bench Lathe. Hjorth Lathe and Tool Co., Boston, Mass. Catalog No. 12, describing a late model of Hjorth lathe, with several patented attachments.

Stellite Tools. Haynes Stellite Co., 30 East 42nd St., New York City. Vol. 10 of the Stellite Reference Library, taking up the description of stellite welded-tip tools.

"Little Giant" Air Hoists. Chicago Pneumatic Tool Co., 6 East 42 St., New York City. Bulletin No. 640, covering various types of air hoists, motors and wrenches, all equipped with "Little Giant" gearing.

Centilathes. Cincinnati Lathe and Tool Co., Oakley, Cincinnati, Ohio. Catalog describing a line of Cincinnati lathes.

Obituary

Aubrey G. Robb, for over 20 years superintendent and chief engineer of the Robb Engineering Works, Amherst, Canada, died from blood poisoning on June 20, following an illness of four days. The deceased was in his fifty-first year. He was recognized as one of the ablest mechanical engineers in eastern Canada.

Charles E. Geiger, 64 years old, president of the Louisville Drying Machine Co., died at his residence, Louisville, Ky., on June 18. Dropsy was the immediate cause of death, though he had been ill for six months.

Forthcoming Meetings

The third annual convention and exhibition of the American Society for Steel Treating will be held in the Manufacturers Building, State Fair Grounds, Indianapolis, Ind., during the week of September 19 to 24 inclusive.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Thermometer, Recording

Brown Instrument Company, Wayne Junction, Pa.

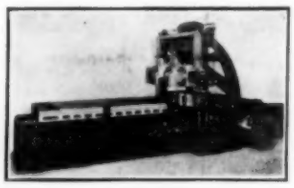
"American Machinist," March 31, 1921

The machine incorporates a number of features not contained in the older types of Brown instruments, and is said to be especially adapted for measuring temperatures of quenching baths, oil-tempering baths, and core ovens. Among other features, the thermometer is provided with means for adjusting the pen arm for "set" and "tension," and the helix is also adjustable for calibrating. The pen is inverted so that the ink cannot run down on the arm, and lifts automatically when the door is opened, resting on the paper again when the door is closed.

Planer, 32 x 32-In. x 10-Ft.

Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.

"American Machinist," April 7, 1921

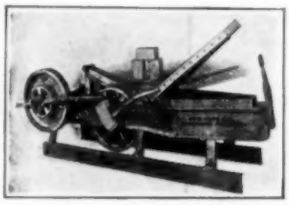


Though a second belt is used, there is an additional reduction obtained by gearing. The cushioning effect of the second belt is said to reduce the shock of reversal. The bed is of the box type, closed at the top and open at the bottom, except for a short space at the center. The table is of box section. The Whitcomb patent lever binder is used to lock the cross-rail, and self-locking table dogs are provided. The machine will plane work 32 in. wide, 32 in. high and 10 ft. long. It can be furnished with belt or motor drive. Driving pulleys accommodate a 3-in. belt. The weight of the machine is 17,500 lb., and the bed occupies a floor space of about 7 x 16 ft. A 15-hp. motor is required to drive it.

Press, Scrap-Baling

Reeves-Boggs Machinery Co., 2926 Grand Ave., Chicago, Ill.

"American Machinist," April 7, 1921

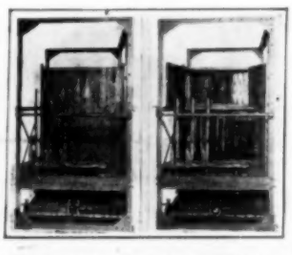


This baling press or cabbaging machine is made in four sizes. The two smaller sizes make bales 5 x 5 x 10 and 5 x 5 x 12 in. in size, respectively, and are intended for baling skeleton punchings of sheet brass, copper, aluminum or other soft metals. The two larger presses make bales of 12 x 12 x 12 and 14 x 14 x 16 in., respectively, and will handle sheet-metal scrap of 14 gage and lighter. The machine is belt driven. The baling pressure is exerted by two side wings that are closed in by wedge-like slides carried by the ram, which is at the same time advancing and exerting pressure on the end of the bale. Five horsepower is required. The net weight for the two smaller sizes is 3,500 lb. and for the larger sizes, 4,000 and 6,000 lb., respectively.

Cab, Crane, Safety

Pawling & Harnischfeger Co., Milwaukee, Wis.

"American Machinist," April 7, 1921

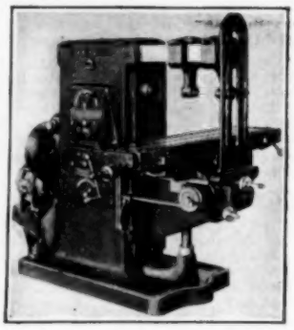


In this crane cab the entire controller equipment and current-carrying parts are enclosed, as shown on the left of the illustration, the arrangement being intended to provide a maximum of safety for the operator. The main switch, which is of the safety type, is operated by a lever extending through the switchboard cabinet. The control levers are placed at the front of the cage and allow the operator an unobstructed view of the floor and the movements of the crank hook. All parts are accessible, the opening of the rear doors exposing the live parts for inspection and adjustment, as shown at the right. Access to the wiring, which is at the rear, can be had by removing a panel.

Milling Machine, "High Power," No. 3

Rockford Milling Machine Co., Rockford, Ill.

"American Machinist," April 7, 1921

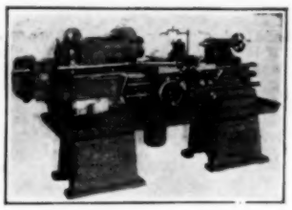


This machine is a redesign of the former No. 3 milling machine, being intended for heavy-duty and having a single-pulley all-geared drive. The overarm is rectangular in sections and can be moved in and out by means of a crank. The feed motion is transmitted to the saddle and table mechanism without the use of telescopic shafts and universal joints. Sliding gears are employed in the feed-change mechanism. A control box on the right-hand side of the machine permits the feed and quick-return motion to be started in either direction by the movement of a single lever. Much of the mechanism is enclosed in the column. A 10-hp. motor can be mounted on the rear of the base. Net weight 7,270 lb.

Lathe, Toolroom, Cone Head, 14-In.

Reed-Prentice Co., Worcester, Mass.

"American Machinist," April 7, 1921



The lathe differs from the company's standard lathe of its type and size only in having a head fitted with a four-step cone, instead of having the regular geared head for constant-speed drive. The largest diameter of the cone is 8½ in. and the smallest 4½ in. The steps take a 2½-in. belt. The front bearing is 2⅞ x 4⅞ in., and there is a 1¾-in. hole through the spindle. The weight of the machine with 6-ft. bed and compound rest is 2,850 lb. All accessories are supplied.

Saw, Cold, Metal, "Lea-Simplex," No. 26

Earle Gear and Machine Co., Stenton and Wyoming Ave., Philadelphia, Pa.

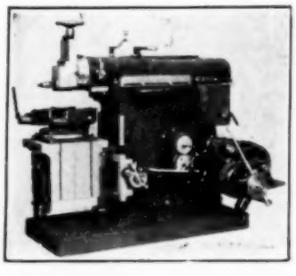
"American Machinist," April 7, 1921

The machine is provided with both a power and a hand traverse, a feed trip and a power return. By means of a quick-change device, the feed can be varied from ⅛ to 1⅛ in. per minute and the changes can be made while the saw is cutting. All operating levers can be reached from one point and one attendant can operate several machines. The machine may be driven by either belt or motor. Saw, 26 in. in diameter. Work table: width, 22 in.; length, 44 in.; height, 35 in. Floor space: belt driven 48 x 72 in. Weight, 4,500 pounds.

Shaper, Heavy-Duty, 28-In.

Hollingworth Machine Tool Co., Covington, Ky.

"American Machinist," April 7, 1921



It is stated that changes have been incorporated in the design of the machine to insure rigidity and accuracy. The machine is furnished either cone-pulley or single-pulley driven, the latter type obtaining speed changes by the incorporation in the drive of a gear box with four gear changes. The single-pulley-driven type of machine may be fitted with direct motor drive, as shown. The shaper is of the crank type and fitted with back gears, so that there is a total of eight speeds available.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED

Machine Tools Wanted

If in need of machine tools send us a list for publication in this column

Conn., Bridgeport—B. S. Michniewicz, Ridge Ave. and Walnut St.—garage repair tools.

Conn., Bridgeport—W. Stone & Bros., 810 Madison Ave.—garage equipment.

Conn., Waterbury—The Dexter Baking Corp., North Main St.—garage equipment.

Mass., New Bedford—J. Telciano, 267 Allen St.—small repair tools.

R. I., Providence—A. J. Finan, 83 Standiford St.—garage equipment.

R. I., Providence — B. Kaufman, 109 Bway.—garage equipment.

R. I., Providence — W. E. Phillips, 14 James St.—garage equipment.

N. Y., New York—The Chassis Fabricating Co., 501 5th Ave.—One 6 x 11 in. lathe complete with compound rest, countershaft, etc.

N. Y., New York—Merolle & Paganelli, 26 Watts St., No. 200 V. & O. automatic threader.

N. Y., Port Richmond, S. I.—The Natl. Lead Co., manufacturer of paint material—Buffalo 10 in. power bench drill press with tight and loose pulley drive, etc., 20 in. drill press back geared, etc.

N. Y., Springville—Spencer's Garage, F. D. Spencer, Purch. Agt.—milling machine and 8 in. swivel vice.

W. Va., Wheeling—The Steam Electric Eng. Co., 1512 Market St.—One ½-in. universal electric drill and one ¼-in. universal electric drill.

Ill., Paxton—The Bd. Educ., c/o J. C. Strong, Pres.—manual training equipment.

O., Columbus—The Shartle Machine Co., 359 Duplin Ave., G. W. Shartle, Pres. and Genl. Mgr.—20 in. drill press, No. 70 Heald grinder, 36 to 42-in. shaft grinder and a 24-in. planer (used).

Machinery Wanted

Pa., Kittaning—The Templeton Limestone Co., Harry & Wolfe, Purch. Agts.—stone crushers, belting, etc.

Pa., Pittsburgh—W. S. Rae, (contractor) Room No. 439 Oliver Bldg.—20 ton electric crane.

Mo., Clinton—The Terrill Tire & Rubber Co.—$42,000 worth of tire machinery.

Ont., Beachville—The Beachville Cooperative Creamery, G. J. Cook, Pres.—refrigeration equipment.

Metal Working Shops

NEW ENGLAND STATES

Conn., Bridgeport—B. S. Michniewicz, Ridge Ave. and Walnut St., plans to build a 1 story garage. Estimated cost $12,000. Private plans.

Conn., Bridgeport—W. Stone & Bros., 810 Madison Ave., are having plans prepared for the construction of a 1 story, 70 x 120 ft. garage and service station on Madison Ave. Estimated cost $25,000. J. E. Stone, Canaan Rd., Stratford, Archt.

Conn., Hartford—The Chopel Co., Chopel St., has awarded the contract for the construction of a 1 story, 60 x 150 ft. garage. Estimated cost $25,000.

Conn., Manchester — W. R. Tinker, Jr., 57 Wells St., has had plans prepared for the construction of a 1 story, 60 x 65 ft. garage on Center and Church Sts. Estimated cost $15,000. Private plans.

Conn., Stamford—W. J. O'Brien, 468 Main St., has awarded the contract for the construction of a 1 story, 75 x 110 ft. garage on Gay St. Estimated cost $30,000.

Conn., Waterbury—The Bradford Auto Sales Co., 476 Meadow St., is having plans prepared for the construction for a 1 story, 70 x 120 ft. garage and service station. Estimated cost $25,000. Private plans.

Conn., Waterbury — The Dexter Baking Corp., North Main St., will soon award the contract for the construction of a 1 story, 60 x 109 ft. garage and repair station. Estimated cost $20,000. J. S. LaDow, 51 Leavenworth St., Archt. Noted June 2.

Conn., Willimantic—H. Israel, 12 Railroad St., will soon award the contract for the construction of a 1 story, 60 x 60 ft. garage on Main St. Estimated cost $10,000. Private plans.

Me., Auburn—The Darling Auto Co. has awarded the contract for the construction of a 2 story, 80 x 100 ft. garage. Estimated cost $40,000.

Mass., Brookline (Boston P.O.)—Gorfinkle & Barkin are having plans prepared for the construction of a 1 story, 151 x 175 ft. garage on Harvard St. Estimated cost $60,000. H. F. Bryant, 334 Washington St., Archt.

Mass., Dartmouth—The Gardner Storage Battery Co., Inc., 126 County St., New Bedford, is having plans prepared for the construction of a 1 story, 55 x 100 ft. factory for the manufacture of storage batteries. Estimated cost $10,000. Private plans.

Mass., Leominster—Cousens & Gustafson, North Main St., will build a 1 story, 40 x 70 ft. garage. Estimated cost $10,000.

Mass., New Bedford—J. B. Ashley, 366 Union St., has had plans prepared for the construction of a 1 story, 60 x 190 ft. garage on Mill St. Estimated cost $25,000. LaBrode & Bullard, 251 Union St., Archts.

Mass., New Bedford—John T. Dawson, 1663 Purchase St., has awarded the contract for the construction of a 1 and 2 story garage and service station on Hope St. Estimated cost $20,000.

Mass., New Bedford—G. G. Sylvia, 543 Union St., will build a 1 story, 80 x 100 ft. garage including a small repair shop on James St. Estimated cost $15,000. Noted June 16.

Mass., New Bedford—J. Telciano, 267 Allen St., will build a 1 story, 50 x 75 ft. garage and small repair shop. Estimated cost $10,000 Noted June 16.

Mass., North Adams—Less & Chornick, 21 State St., will build a 1 story, 40 x 100 ft. garage, etc., on Ashland St. Estimated cost, $20,000. Noted June 30.

Mass., Pittsfield—The Berkshire Auto Co., North St is having plans prepared for the construction of a 1 story garage and service station on South St. Estimated cost $40,000.

Mass., Pittsfield—The City Garage & Sales Co., 501 North St., is having plans prepared for a 3 story, 100 x 130 ft. addition to its garage and service staton. Estimated cost $150,000. Architect not selected.

Mass., Quincy—G. E. Carlson, 86 Huskins Ave., has awarded the contract for the construction of a 1 story garage. Estimated cost $10,000.

Mass., Springfield—A. and M. Batt, 32 Phoenix St., plans to build a 1 story garage. Estimated cost $10,000. Private plans.

Mass., Springfield—The Springfield Bronze Co., 166 Charles St., has awarded the contract for the construction of a 1 story, 40 x 65 ft. foundry on Charles St. Estimated cost $10,000. Noted June 9.

N. H., Charleston—The Bowen Motor Car Co. will soon award the contract for the construction of a 2 story, 57 x 165 ft. garage on Main St. Estimated cost $80,000. G. W. Griffin, 72 North Main St., Concord. Archt. Noted March 10.

N. H., Nashua—H. C. Lintott, 25 Main St., plans to build a 2 story garage. Estimated cost $40,000. Private plans.

N. H., Nashua—The Mercer Bros., 280 Main St., has had plans prepared for the construction of a 2 story 100x100 ft. garage. Estimated cost $100,000. Hutchins & French, 8 Winter St., Boston, Mass., Archts.

R. I., Providence—J. Collicci, Ridge St., plans to build a 1 story, 40 x 80 ft. garage and service station. Estimated cost, $20,000. Private plans.

R. I., Providence—W. J. Farrow, State St., plans to build a 1 story, 40 x 75 ft. garage building on Boone St. Estimated cost, $15,000. Private plans.

R. I., Providence—A. J. Finan, 83 Staniford St., will soon award the contract for the construction of a 1 story garage and service station on Plain St. Estimated cost, $30,000. Private plans. Noted June 16.

THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.80
Northern Basic	25.50
Southern Ohio No. 2	25.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	32.26
BIRMINGHAM	
No. 2 Foundry	22.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25–2.75	27.26
Virginia No. 2	*27.00
Basic	†25.00
Grey Forge	24.40
CHICAGO	
No. 2 Foundry local	22.00
No. 2 Foundry, Southern, sil 2.25@ 2.75	28.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	24.96
Basic	23.46
Bessemer	24.96

* F. o. b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York Warehouse Jersey City	New York Delivered	Cleveland	Chicago Delivered
Structural shapes	$3.23	$3.33	$3.09	$3.23
Soft steel bars	3.13	3.23	2.99	3.13
Soft steel bar shapes	3.13	3.23	3.48	3.13
Soft steel bands	4.18	4.28	6.25	
Tank plates	3.23	3.33	3.40	3.23

BAR IRON—Prices per 100 lb. at the places named are as follows:

Mill, Pittsburgh	$2.20
Warehouse, New York, delivered	3.13
Warehouse, Cleveland	3.52
Warehouse, Chicago	3.13

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York,	Cleveland	Chicago
No. 10	3.10	4.25	3.85	4.13
No. 12	3.15	4.30	3.90	4.18
No. 14	3.20	4.35	3.95	4.23
No. 16	3.30	4.45	4.05	4.33
Black				
Nos. 17 and 21	3.75	4.80	4.55	5.20
Nos. 22 and 24	3.85	4.85	4.60	5.25
No. 25 and 26	3.90	4.90	4.65	5.30
No. 28	4.00	5.00	4.75	5.40
Galvanized				
No. 10 and 11	4.00	4.75	4.75	5.70
No. 12 to 14	4.10	4.85	4.85	5.80
Nos. 17 and 21	4.40	5.15	5.15	6.10
Nos. 22 and 24	4.55	5.30	5.30	6.25
No. 26	4.70	5.45	5.45	6.30
No. 28	5.00	5.75	5.75	6.40

COLD FINISHED STEEL—Warehouse base prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb.	$4.73	$4.63	$4.25
Flats, squares and hexagons, per 100 lb.	5.23	4.63	4.75

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent
New York	55%
Cleveland	55%
Chicago	50%

Electric Welding Wire—Welding wire in 100-lb. lots sells as follows, f.o.b. New York: 5/16, 8½c. per lb.; ¼, 8c.; 5/32 to 1/8, 7½c. Domestic iron sells at 12c. per lb.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York	Cleveland	Chicago
Openhearth spring steel (heavy)	5.50	7.00	8.25
Spring steel (light)	8.00	7.00	10.50
Coppered Bessemer rods (base)	8.00	8.00	6.20
Hoop steel	3.64	3.64	3.83
Cold rolled strip steel	6.00	8.25	7.90
Floor plates	5.30	3.09	5.78

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card of April 13, 1921:

BUTT WELD

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
1 to 3	62½	50	⅜	33½	18½
			1 to 1¼	35½	20½

LAP WELD

2	54½	41	2	30½	16½
2½ to 6	58½	45	2½ to 4	34½	22½
7 to 12	54½	44	4½ to 6	33½	21½
13 and 14	45	37	7 to 8	24½	12½
15	42½	32	9 to 12	19½	7½

BUTT WELD, EXTRA STRONG, PLAIN ENDS

1 to 1½	60½	49	1 to 1½	35½	21½
2 to 3	61½	50			

LAP WELD, EXTRA STRONG, PLAIN ENDS

2	52½	41	2	31½	18½
2½ to 4	56½	45	2½ to 4	34½	22½
4½ to 6	55½	44	4½ to 6	33½	21½
7 to 8	50½	37	7 to 8	24½	12½
9 to 12	45½	32	9 to 12	19½	7½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

METALS

MISCELLANEOUS METALS—Present and past New York jobbers' quotations in cents per pound, in quantities up to car lots:

Copper, electrolytic	13.75
Tin in 5-ton lots	29.50
Lead	4.75
Zinc	5.75
ST. LOUIS	
Lead	4.85
Zinc	5.35

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York	Cleveland	Chicago
Copper sheets, base	21.10	22.00	23.50
Copper wire (carload lots)	16.00	17.50	20.00
Brass sheets	16.25	20.00	20.75
Brass pipe	19.00	22.00	24.50
Solder (half and half) (case lots)	20.00	23.50	17.50

Copper sheets quoted, above hot rolled 24 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are in cents per pound at warehouse:

New York	14.25
Cleveland	16.00
Chicago	18.75

NICKEL AND MONEL METAL—Base prices in cents per pound, any quantities, f.o.b. Bayonne, N. J.

Nickel	
Ingots and hot	41
Electrolytic	44

Monel Metal			
Shot and blocks	35	Hot rolled rods (base)	42
Ingots	38	Cold rolled rods (base)	56
Sheet bars	40	Hot rolled sheets (base)	55

Special Nickel and Alloys	
Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grade "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods, "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

SHOP MATERIALS & SUPPLIES

ZINC SHEETS—The following prices in cents per pound are f. o. b. mill less 8% for carload lots..... 10.00

	Warehouse	
	In Casks	Broken Lots
New York	11.50	12.00
Cleveland	11.15	11.50
Chicago	15.75	16.25

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

New York	6.00
Chicago	6.00
Cleveland	7.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.00	$10.00
Copper, heavy, and wire	9.00	9.50	9.00
Copper, light, and bottoms	8.00	7.50	8.00
Lead, heavy	3.25	3.50	3.75
Lead, tea	2.00	2.50	2.75
Brass, heavy	6.00	5.50	9.00
Brass, light	4.50	4.00	5.00
No. 1 yellow brass turnings	5.00	4.50	5.00
Zinc	3.00	2.50	3.50

ALUMINUM—The following prices are spot from warehouse, cents per pound:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	28.4	25.00@26.00	30.00

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current
New York (round)	22.75
Chicago	20.50
Cleveland	22.50

BABBITT METAL—Warehouse price in cents per pound:

	New York	Cleveland	Chicago
Best grade	70.00	41.00	35.00
Commercial	30.00	14.75	9.00

NOTE—Price of babbitt metal is governed largely by formula, no two manufacturers quoting the same prices. For example, in New York, we quote the best grades, although lower grades may be obtained at much lower prices.

SHOP SUPPLIES

The market is very soft, and our quotations for the present are useful only as guide.

NUTS—From warehouse at the places named, on fair-sized orders, the following discount is deducted from list:

	New York	Cleveland	Chicago
Hot pressed square	List	$2.25	1.60
Hot pressed hexagon	List	2.25	1.60
Cold punched hexagon	List	2.25	1.60
Cold punched square	List	2.25	1.60

Semi-finished nuts, ⅞ and smaller, sell at the following discounts from list price:

	Current
New York	60%
Chicago	50%
Cleveland	80%

MACHINE BOLTS—Warehouse, discounts in the following cities:

	New York	Cleveland	Chicago
All sizes up to 1 by 30 in	50–10%	60–10%	50%
1¼ and 1½ in. by 3 in. up to 12 in	50%	50–5%	45%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York..... $2.00 Cleveland..... $4.50 Chicago..... $4.00
For cast-iron washers, ¼ and larger, the base price per 100 lb. is as follows:
New York..... $4.50 Cleveland..... $3.75 Chicago..... $4.00

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	40%	60%	40%
Larger and longer up to 1 in. by 30 in	40%	50–10%	40%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets	Burs
Cleveland	40%	10%
Chicago	net	net
New York	40%	25%

RIVETS—The following discounts are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	50%	60–10%	45%
Tinned	45%	60–10%	30%

Structural, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:
New York...$4.65 Cleveland...$4.25 Chicago....$4.88 Pittsburgh..$3.70
Boiler, same sizes:
New York...$4.75 Cleveland...$4.35 Chicago....$4.98 Pittsburgh..$3.80

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	21.00	25.00	25.50
Brass	19.00	23.00	24.50

Prices vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities less than 25 lb. add 10c. per lb.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ¼-2 in., inclusive in rounds, and ½-1½ in., inclusive in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $0.75.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $7.70 per 100 lb. In Cleveland—$7.50 per 100 lb.; New York prices is $7.50.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	Cleveland	Chicago
White	7.50@10.00	12.00	14.25
Colored mixed	5.50@ 9.00	9.00	12.00

WIPING CLOTHS—Jobbers' price per 1,000 is as follows:

	13½x13½	13½x20½
Cleveland	$55.00	$65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current
New York (5 bbl.)	$2.10
Philadelphia (5 bbl)	1.85
Cleveland	3.00
Chicago	2.50

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current
New York (5 bbl.)	$2.55
Philadelphia (5 bbl.)	2.55
Chicago	4.50

COKE—The following are prices per net ton at ovens, Connellsville.

	Current
Prompt furnace	$3.00@$3.25
Prompt foundry	4.00@ 4.50

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	100-lb. bag	$0.80
Cleveland	100-lb. bag	0.80

LINSEED OIL—These prices are per gallon:

	Current		
	New York	Cleveland	Chicago
Raw in barrels (5 bbl. lots)	$0.80	$0.88	$0.87
5-gal. cans	.83*	1.03	1.12

*Charge of $2.25 for two cans.

WHITE AND RED LEAD—Base price per pound:

	Current		
	Red		White
	Dry	In Oil	Dry and In Oil
100 lb. keg	13.00	14.50	13.00
25 and 50-lb. kegs	13.25	14.75	13.25
12½-lb. keg	13.50	15.00	13.50
5-lb. cans	16.00	17.50	16.00
1-lb. cans	18.00	19.50	18.00

500-lb. lots less 10% discount; 2,000-lb. lots less 10-4% discount; 10,000 lb. lots less 10-7½% discount. Business is good in white lead.

R. I., Providence — B. Kaufman, 109 Bway., will build a 1 story garage and service station on Federal St. and Bway. Estimated cost, $6,500. Noted June 16.

R. I., Providence—Kaminsky & Levin, c/o H. M. Marshak, Archt., 312 Strand Bldg., are having plans prepared for the construction of a 1 story garage and service station on South Main, Gregory and South Water Sts. Estimated cost, $40,000.

R. I., Providence—A. J. Martin, 259 Plain St., will soon award the contract for the construction of a 1 story, 50 x 100 ft. garage and service station. Estimated cost, $30 000. Private plans. Noted June 16.

R. I., Providence—W. A. Muiry Co., 97 Empire St., has awarded the contract for the construction of a 1 story, 120 x 133 ft. garage on Elmwood Ave. Estimated cost $30,000. Noted April 21.

R. I., Providence — W. E. Phillips, 14 James St., plans to build a 1 story, 40 x 100 ft. garage and service station on James St. Estimated cost, $10,000. Private plans.

R. I., Providence — The Providence Ice Co., 17 Exchange St., plans to build a 1 story, 45 x 100 ft. garage and repair shop on Burnett and Greenwich Sts. Estimated cost, $15,000. Private plans.

Vt., Rutland—W. H. Williams has awarded the contract for the construction of a 1 story, 68 x 129 ft. service station. Estimated cost $50,000.

MIDDLE ATLANTIC STATES

D. C., Anacostia (Washington P.O.)—The Bureau of Yards and Docks, Navy Dept., Washington, D. C., has awarded the contract for the construction of a shop building at the Naval Air Station here. Estimated cost $31,345. Noted March 17.

D. C., Washington—The Aberinale Investment Co. is having plans prepared for the construction of a garage. Estimated cost $200,000. W. B. Wood, 816 Connecticut Ave., N.W., Archt.

N. Y., Coney Island—W. F. Mangels Co., West 8th St., manufacturer of mechanical amusement devices, plans to build a 90 x 200 ft. addition to its plant.

N. Y., New York (Borough of Manhattan)—The Henwood Bldg. Corp., c/o Dunnigan & Crumley, Archts. and Engrs., 394 East 150th St., will build a 1 story, 100 x 150 ft. garage on Henwood Pl. near Walton Ave. Estimated cost, $50,000.

N. Y., New York (Borough of Manhattan)—L. T. Phelan, c/o Dunnigan & Crumley, Archts. and Engrs., 394 East 150th St., will build a 1 story, 100x150 ft. garage on Burnside Ave., near Ryer Ave. Estimated cost $75,000.

N. Y., New York (Borough of Manhattan)—A. J. Schwanzler, c/o S. J. Kessler, Archt. and Engr., 529 Courtland Ave., will build a 1 story, 85 x 200 ft. and a 4 story, 85 x 100 ft. garage on 174th St. and Morris Ave. Estimated cost $120,000.

SOUTHERN STATES

Va., Hampton Roads—The Bureau of Yards and Docks, Navy Dept., Washington, D. C., has awarded the contract for the construction of a machine and carpenter shop here. Estimated cost $108,434. Noted June 30.

MIDDLE WEST STATES

O., Cleveland—The Hildebrandt Provision Co., 3616 Clark Ave., has had plans prepared for the construction of a 1 story, 66x100 ft. garage at 3600 Clark Ave. Estimated cost $60,000. Anders & Reimers, Erie Bldg., Archts.

O., Cleveland—S. Hovanatz, United Bank Bldg., will soon award the contract for the construction of a 2 story, 44 x 86 ft. garage on West 50th St. and Lorain Ave. Estimated cost $50,000. Hulet & Stanton, 3129 Scranton Rd., Archts.

O., Cleveland—The Republic Electric Mfg. Co., 1820 East 18th St., has awarded the contract for the construction of a 3 story, 47 x 57 ft. factory and office addition on East 18th St. and Chester Ave. Estimated cost $75,000.

Wis., Kaukauna—The P. H. Pagel Auto Co. will soon award the contract for the construction of a 1 story, 60 x 75 ft. garage. Estimated cost $40,000. H. O. Weldon, 10 South La Salle St., Chicago, Ill., Archt.

Wis., Milwaukee—A. Dietrich, c/o Rosman & Wierdsma, Archts., 424 Jefferson St., has awarded the contract for the construction of a 1 story, 60 x 120 ft. garage and repair shop on Lisbon Ave. Estimated cost $42,000.

Wis., Oshkosh—The Kaewer Auto Co., c/o Auler & Jensen, Archts., F. R. A. Bldg., is having plans prepared for the construction of a 1 story, 72 x 100 ft. garage on Main St. Estimated cost $50,000.

STATES WEST OF THE MISSISSIPPI

Ia., Des Moines—The Keith Furnace Co., c/o R. S. Keith, Court Ave., will receive bids until July 12 for the construction of a 1 and 2 story factory to include a foundry, etc., on East 26th St. and Dean Ave. Estimated cost $150,000. Boyd & Moors, 1020 Grand Ave., Archts. Noted Jan. 3.

Minn., St. Paul—The Twin City Motor Bus Co., 344 North Exchange St., will receive bids about July 1 for the construction of a 1 story, 120 x 150 ft. garage and office building on 5th near 7th St. Estimated cost $40,000. H. A. Sullwold, 643 Endicott Bldg., Archt.

Minn., Young America—Buegel & Mesenbring is having plans prepared for the construction of a 1 and ½ story, 50 x 150 ft. garage, here. Estimated cost $45,000. A. Plagens, New Ulm, Archt.

S. D., Redfield—The State Bd. of Correction of Charities, c/o F. W. Brown, Secy., Lead, will soon award the contract for the construction of a 1 story, 70 x 78 ft., service station. Estimated cost $90,000. C. H. Johnson, Capital Bank Bldg., Minneapolis, Minn., Archt.

WESTERN STATES

Cal., San Diego—The Bureau of Yards & Docks, Navy Dept., Washington, D. C., has awarded the contract for the construction of a machine shop, latrine toilet, fire engine house at the Naval Base Air Station here. Estimated cost $121,400.

CANADA

Ont., Brockville—G. W. Warwick, 111 King St., West, plans to rebuild 1 story garage on Home St., which was recently destroyed by fire. Estimated cost $15,000.

General Manufacturing

NEW ENGLAND STATES

Conn., Ansonia—The Ansonia O. & C. Co., 153 Main St., will soon award the contract for the construction of a 2 story, 75 x 240 ft. addition to its plant for the manufacture of web braids. Estimated cost, $125,000. Lockwood, Greene & Co., 101 Park Ave., New York City, Archts. and Engrs.

Mass., Everett—Briggs, Maroney Co., Inc., 85 Paris St., manufacturers of paint, has awarded the contract for the remodeling of a 3 story factory. Estimated cost $25,000. Noted Jan. 20.

Conn., Middletown — The Millbrook Dairy Co., 4 Main St., will soon award the contract for the construction of a 3 story, 50 x 60 ft. dairy plant, etc., on Church and Broad Sts. Estimated cost, $40,000. Buck & Sheldon, Inc., 60 Prospect St., Hartford, Archts. and Engrs. Noted May 26.

Mass., Springfield—C. P. Chase Co., 68 Birnie Ave., has awarded the contract for construction of a 3 story, 40 x 60 ft. factory and lumber mill.

N. H., Dover—P. Sherrell & Sons, Inc., has awarded the contract for the construction of a 1 story, 45 x 130 ft. and 25 x 105 ft. additions to its shoe factory. Estimated cost $25,000.

MIDDLE ATLANTIC STATES

N. Y., New York (Borough of Manhattan)—The Lorillard Tobacco Co., 119 West 40th St., is having plans prepared for the construction of a 3 story, 200 x 205 ft. factory on 73d St. and Ave. A. Estimated cost $150,000. Francisco & Jacobus, 511 5th Ave., Archts. and Engrs.

N. J., Trenton—The Huslander Engraving Co. is having plans prepared for the construction of a 3 story, 40 x 60 ft factory. Estimated cost $40,000. Fowler Seaman Co., Broad St. Bank Bldg., Archt.

Pa., Roanoke—The Amer. Viscose Co., Marcus Hook, is having preliminary plans prepared for the construction of a silk plant. Estimated cost $1,000,000. The Bollinger Co., 105 South 12th St., Philadelphia, Archt. and Engr.

MIDDLE WEST STATES

Ill., Aurora—The Miller Bryan Pierce Co., 225 River St., manufacturer of typewriter supplies, is having plans prepared for the construction of a 3 story, 60 x 150 ft., factory. Estimated cost $160,000. Lockwood Greene Co., 385 Dearborn St., Chicago, Archts.

Ind., Chesterton—The United States China Co. plans to build a 2 story, 100 x 300 ft. pottery plant to cost $100,000 and a 3 story, 50 x 50 ft. machinery building to cost $75,000. Private plans.

Ind., Indianapolis—F. D. Gardner Co., 221 East Maryland St., will soon award the contract for the construction of a 2 story, 80 x 180 ft. packing plant along the White River here. Estimated cost $75,000. Wanninwetsch & Co., 563 William St., Buffalo, N. Y., Archt.

O., Cleveland—The Empire Rolling Mills Co., Bessimer Ave., has awarded the contract for the construction of a 1 story, 81 x 172 ft. factory and warehouse. Estimated cost $75,000.

O., Cleveland—The Natl. Carpet Cleaning & Rug Mfg. Co., 1971 West 50th St., will soon award the contract for the construction of a 2 story, 40 x 123 ft. factory on West 50th St. and Lorain Ave. Estimated cost $75,000. Whitworth & Johnson, 413 B. of L. E. Bldg., Archts.

O., Kent—The Western Reserve Cotton Mills Co. is having plans prepared for the construction of a 3 story cotton mi. Estimated cost $300,000. Lockwood Green & Co., Hanna Bldg., Cleveland, O., Archts. and Engrs.

Wis., Milwaukee—The Milwaukee Sales & Investment Co., 425 East Water St., has awarded the contract for the construction of a 2 story, 50 x 100 ft. factory for the manufacture of films on Sycamore St. Estimated cost $40,000.

Wis., Neenah—G. Danke, Main St., has awarded the contract for the consuction of a 2 story, 40 x 75 ft. creamery. Estimated cost $40,000. Noted June 2.

Wis., Neenah—The Jersild Knitting Co., 331 North Commercial St., has awarded the contract for the construction of an additional 50 x 200 ft. factory. Estimated cost, $42,000.

STATES WEST OF THE MISSISSIPPI

Mo., Clinton—The Terrill Tire & Rubber Co. will build a 2 story, 90 x 150 ft. tire and rubber factory near here. Estimated cost $25,000.

Mo., St. Louis—The Fleischmann Yeast Co., 1535 Market St., has awarded the contract for the construction of a 1 story, 75 x 170 ft. factory on Forest Park Blvd. and Bogle Ave. Estimated cost $50,000. Noted May 19.

Okla., Bartlesville—E. G. Hanson has awarded the contract for the construction of a mill building. Estimated cost $25,000. Noted June 9.

Okla., Duncan—The Magnolia Petroleum Co. has awarded the contract for the construction of two 1 story, 40 x 260 ft. factories. Estimated cost, $100,000.

Tex., Taft—The Taft Packing Co. will soon award the contract for the construction of a 2 story, 65 x 115 ft. mill, fertilizer house and an addition to its boiler house. H. S. Green, 415 Euclid Ave., San Antonio, Archt.

CANADA

Ont., Beachville—The Beachville Cooperative Creamery plans to build a creamery on Main St. Estimated cost $50,000. G. J. Cook, Pres.